

The Kremlin leader has created a Russia in his own image with a mixture of successes, half-measures and some terrible flaws. John Thornhill reports

Yeltsin's bear has two faces

Every day Mr Georgy Rushansky takes his Polaroid camera and his stuffed reindeer to the central square in the Arctic coal mining town of Yerkuta and makes his living taking snaps of the passers-by.

To a Russian living in a former prison town symbolising the Communist repression of the 1930s, and in a country where the Soviet state controlled everyone's careers and confined their consumer aspirations, Mr Rushansky's simple freedoms are both real and remarkable. "Twenty years ago I could not buy photographic materials. Now I can buy anything I want and I can live the way I want to live," said the 48-year-old bearded photographer.

For such reasons, Mr Rushansky and millions of others will vote for President Boris Yeltsin's re-election on Sunday. In him, they see a politician who has, however imperfectly, pursued the democratic revolution initiated by Mr Mikhail Gorbachev, the last Soviet president, removing much of what one Russian poet called the "menacing idiosyncrasy" of the Soviet Union.

Amid the blizzard of media reports about Russian economic hardships, crime, and the brutal war in Chechnya, it is easy to overlook how much Russia has changed since Mr Yeltsin assumed power in 1991.

After seven decades of flawed social engineering, Russia was a bankrupt state of empty shops, warped minds, and shattered illusions. Western diplomats feared desperate refugees would sweep westward and urgently sent food aid to the region.

"We were left with nothing from the Soviet Union, just the hole in the middle of the doughnut," Mr Yeltsin reminded voters on a recent campaign trip.

As Mr Yeltsin celebrates the fifth anniversary of his presidency today, he can perhaps justifiably congratulate himself that his term of office has not been marked by far worse upheavals.

Russia has had to come to terms with the overnight loss of empire, the collapse of an all-pervasive party system which even mediated in the running of dog clubs, and an economic slump which, statistically speaking, has been worse than that endured by the United States in the Great Depression of the 1930s.

Following a messy mass privatisation campaign and a halting financial stabilisation programme, visible signs of regeneration are now evident on Russian streets,

symbolised by the rebuilding of the huge Cathedral of Christ the Saviour in the heart of Moscow.

Everyday goods, such as bananas and personal computers, are on sale even in remote Siberian towns, albeit at prices still unaffordable to many Russians. Millions of Russians have had the opportunity to buy their own apartments and travel abroad.

Mr Yeltsin's strongest campaign message is he wants to finish his mission of turning Russia into a "normal" country, where the individual is free to shape his own destiny, where the state serves rather than controls society, where the economy offers people the possibility of self-improvement.

Despite the progress Mr Yeltsin has made, millions of Russians clearly see terrible flaws in his handiwork which have been fully exploited by his rival presidential candidates.

Mr Gennady Zyuganov, the Communist party leader and chief challenger, condemns Mr Yeltsin for moving too far too fast in destroying the simple certainties of the Soviet era, selling off the country's prized assets for a song, and benefiting only a privileged and corrupt few.

In campaign trips around Russia, he echoes the pensioners who have lost their life savings in the hyper-inflation of 1992-93; the mothers who have lost their sons in Chechnya; the school teachers who have lost contact with relatives in former Soviet republics; and the millions of workers who have lost their jobs and status.

"Yeltsin's five years have resulted in the devastation of the country, war in Chechnya, millions of refugees, the impoverishment of the masses and the closure of thousands of factories," Mr Zyuganov claimed in an interview with Pravda newspaper.

"Two or three more years of such politics and we will lose Russia as our native land. The soul aches for Russia."

Mr Zyuganov attacks "Tsar-president" Yeltsin's democratic credentials as a sham for bloody crushing the Supreme Soviet in 1993 and waging an unconstitutional war in Chechnya, which has killed 30,000 people.

Many of these criticisms are even repeated by some of Mr Yeltsin's one-time supporters from the democratic camp who accuse him of betraying the liberal ideals of 1991 and flagrantly manipulating the media.

Mr Grigory Yavlinsky, leader of the liberal Yabloko faction, and a presidential contender, argues Mr Yeltsin's failed half-measures have discredited the concepts of democracy and capitalism, prompting the fearful Communist backlash.

He believes an unconditional victory for Mr Yeltsin would be almost as frightening as a return to Communism.

"If Boris Yeltsin wins the elections, the oligarchic, monopolistic, criminal, and corrupt regime will grow stronger in Russia. This is very dangerous. This is the legitimisation of authoritarian power in Russia," he says.

The Janus-like face of Mr Yeltsin's administration reflects the complex nature of the man himself. It was never likely that a man of his age, whose political reflexes had been moulded by a lifetime in the Soviet Communist party, could ever divorce himself from



extraordinary individualist with a strong anti-establishment streak. In his autobiography, Mr Yeltsin recalls how he was "always the ringleader, always devising some prank", persuading all his classmates to escape through a first-floor window before their school teacher arrived.

At times, it seems, Mr Yeltsin's only real political philosophy has been to remake the whole country in his image.

Like many of Russia's younger democrats, Mr Yegor Gaidar, the radical former prime minister, reluctantly supports Mr Yeltsin as the only pragmatic means of preventing the return of Communism.

Mr Gaidar questions whether the opportunistic Mr Yeltsin was ever a true democrat and remains sceptical about his intentions after the elections. But Mr Gaidar still holds out some hopes.

"Yeltsin won in 1991, not as a liberal or a democrat but on a very broad coalition of people oriented against Communism," says Mr Gaidar. "I do not exclude the possibility Mr Yeltsin will revert to liberal reforms after the elections."

The chief grounds for optimism are contained in Mr Yeltsin's 127-page election manifesto, a forcefully written call for greater freedom and choice.

Mr Yeltsin's "programme of action" reads like a liberals' wish-list, including promises to devolve more powers from Moscow, develop local government as "schools of democracy", encourage the formation of non-government organisations and even establish rape crisis centres.

On the economy, Mr Yeltsin promises further deregulation, the introduction of a fair tax code, the defence of shareholder rights, an improved welfare state and a balanced budget by the end of his term.

If this manifesto is to be taken seriously, these presidential elections not only concern personality and power but confront a real issue of principle: the role of the state. "I consider it to be my main task to build a state which will not be the exclusive property of one political force and will not dictate to society how it should live, but will only be its reliable and effective servant," Mr Yeltsin promises.

Such a claim provokes pained laughter among Mr Yeltsin's fellow-presidential candidates, given how he has enlisted every arm of state power for his re-election campaign.

But if Mr Yeltsin maintains the will and energy to implement that promise he would overturn a centuries-old Russian tradition of arbitrary state power.

In doing so, he may yet provide sufficient time for the values of a market economy and a liberal democracy to suffuse the country, providing the basis for a stable society. At present, even the younger democrats concede they represent the interests of a middle class which does not yet exist.

Only a second term will prove whether Mr Yeltsin is such an unacknowledged visionary or simply a slave to power and a prisoner of his past.

Mr Yeltsin has provided the Russian people with overwhelming evidence to doubt him. But the majority may yet conclude that an erratic, instinctively authoritarian 65-year-old former Communist is still their best hope for entering the next millennium as a normal country.



Boris' bons mots

As a radical reformer
Why, after so many years, have we not succeeded in tearing out of our life the roots of bureaucracy, social injustice and abuses? February 1996

On Russia's economic upheaval
I know how difficult life is for you at the moment. I feel all your pain, all the country's pain. However, I am sure that this is the pain of a recovering organism. May 1996

On his performance as president
I have made mistakes, but I know better than anyone else how to correct them! May 1996

On the election
This may be the last chance for us to break out of the vicious circle, to make irreversible the movement of Russia towards democracy and a normal fruitful life. February 1996

On the 1991 coup plotters
Leftovers from the old Communist party and government elite, militant nationalists, incompetent collective farm bosses and political adventurers...ghosts of the past, playing to a theatre of shadows. November 1992

On his rival Zyuganov
If he came to power and implemented the policies he talks about to Russians, it would be fatal for the Russian economy. February 1996

On relations with the west
Those who insist on an expansion of Nato are making a major political mistake. The flames of war could burst out across the whole of Europe. September 1995

On increasing tax on vodka
We need to find other sources to fill up the budget so as not to worry people. February 1996

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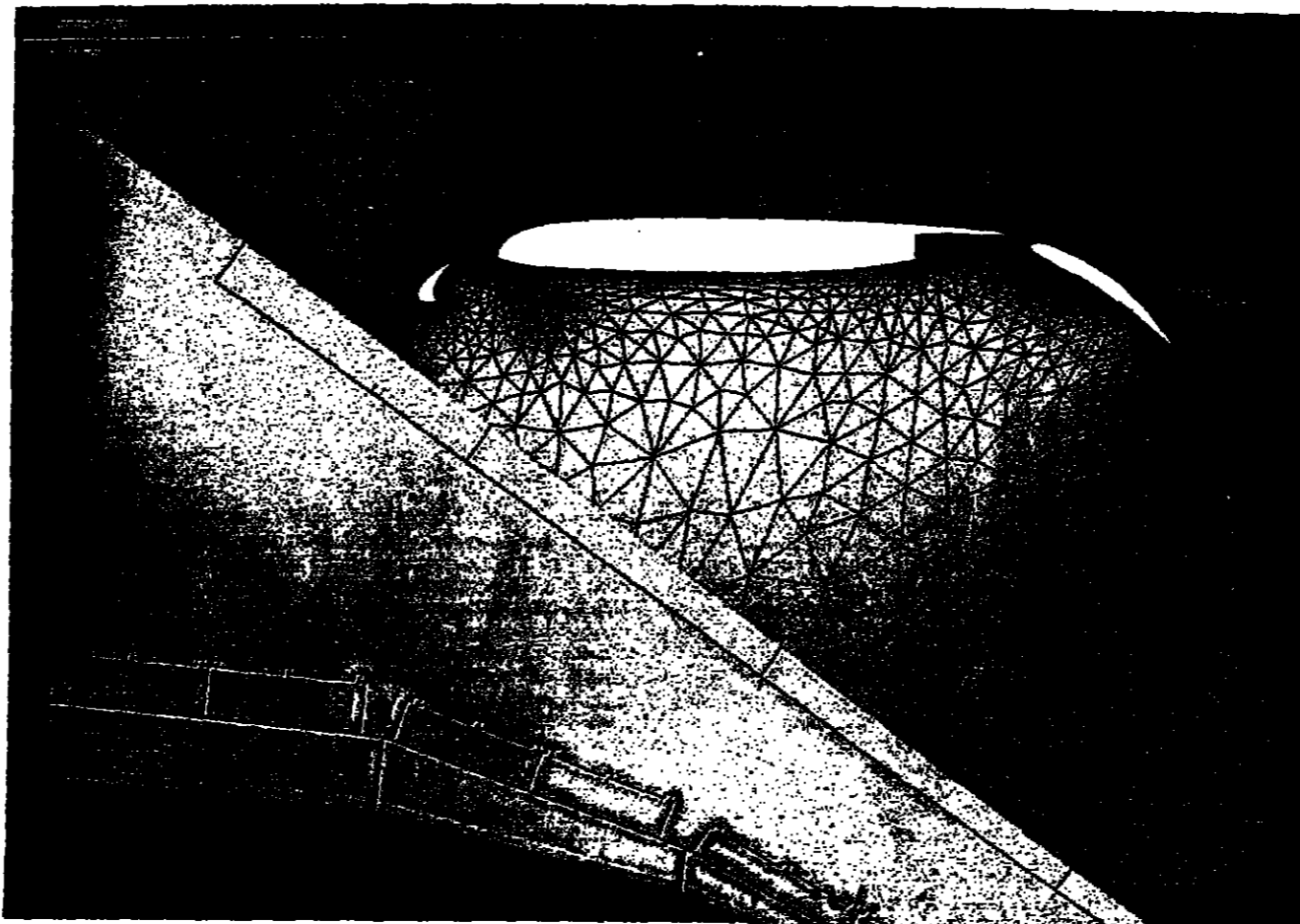
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John J. Lawson, President,
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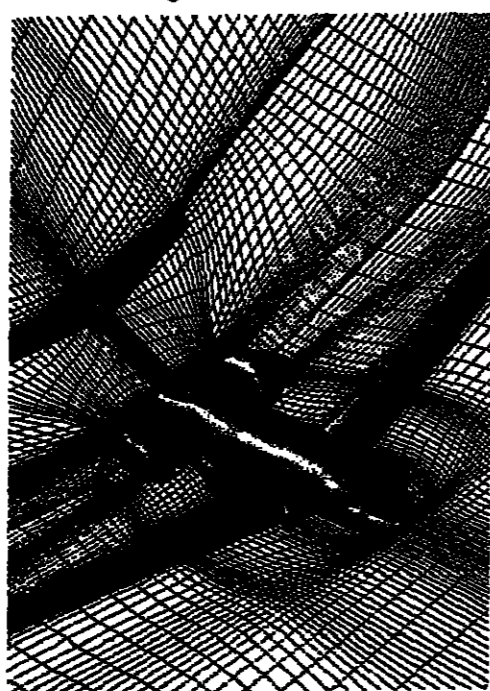
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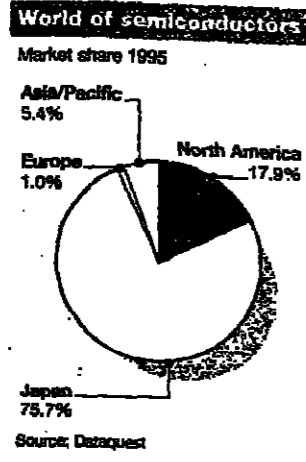


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Japan agrees to talks on chip accord



By Michio Nakamoto in Tokyo

Japan and the US are to hold talks in an attempt to break the deadlock over renewal of the controversial semiconductor agreement which expires at the end of July.

The decision by Japan's trade ministry to agree to talks represents a significant shift from its previous stance of rejecting any further government involvement in the semiconductor issue.

The ministry of international trade and industry had insisted it would let the bilateral agreement expire next month, despite persistent US pressure

to renew the accord.

Although Japanese officials have been willing to discuss the issue with US officials, Miti had made clear it did not consider official talks necessary.

The Japanese position has been that since the domestic semiconductor market is completely deregulated, any initiative involving greater market access for foreign companies should be led by the private sector.

To that end, the Electronic Industries Association of Japan has called on the US Semiconductor Industry Association and European chipmakers to set up a world semiconductor

body to boost industry co-operation.

While European chipmakers have been keen on the idea, the SIA has failed to respond to proposals made this month by the Japanese.

In May, the SIA abruptly postponed its tenth annual regular meeting with its Japanese counterpart "until the US and Japan reach accord on a new inter-governmental trade agreement".

Yesterday's conciliatory move by Miti indicates its acknowledgment that the US is unlikely to participate in such private-sector co-operation without the involvement, in

some form, of the government.

Any private sector co-operation would hold little meaning without the participation of the US, trade officials concede.

"We have not changed our position against monitoring the market, but it looks like industry-level talks will not progress unless there are government-level discussions," a Miti official conceded.

The US wants to renew a government agreement along the lines of the 1991 US-Japan Semiconductor Arrangement, which recognised the US industry's expectation that the foreign share of the Japanese market would exceed 20 per

cent by the end of 1992.

The Japanese government is unhappy with that agreement, which requires official monitoring of foreign market share in Japan. It counters that since there are no government regulations hindering access to Japan's semiconductor market, there is no need for government intervention.

Miti does not expect the talks, scheduled for next week, to lead to a new semiconductor agreement.

Instead, it proposes to exchange views on how the two governments might lay the groundwork for industry-to-industry co-operation.

Labour rights plea to WTO

By Frances Williams in Geneva

The US and France yesterday renewed calls for the World Trade Organisation to study the link between labour standards and trade, despite strong opposition from developing countries.

Addressing the annual meeting of the International Labour Organisation in Geneva, French President Jacques Chirac said trade liberalisation, the development of employment and respect for fundamental labour rights were "inseparable".

"We must seek a way to link respect for the social dimension... and the liberalisation of international trade," he said, urging that the issue be discussed by the ministerial conference of the WTO in Singapore in December.

Mr Robert Reich, US labour secretary, who also addressed the ILO conference, called for a WTO working party to consider the trade body's role in implementing core labour standards.

Mr Reich, who earlier met Mr Renato Ruggiero, WTO director general, said he sensed a greater willingness among developing countries to discuss the issue than previously.

This was partly because those in favour of a "social

clause" in the WTO had made clear their concern was with core labour standards upholding basic human rights and not with so-called "developmental" standards such as wages and working conditions which tended to improve as a country became richer.

Many developing countries, especially in Asia, fear discussion of labour standards in the WTO would serve as a pretext for the use of trade sanctions aimed at removing their cheap labour advantage.

However, Mr Reich said upholding basic rights - a ban on forced labour and child labour, non-discrimination and the right to form a union and bargain collectively - was not only a justifiable humanitarian concern but necessary to maintain political support in rich nations for further trade liberalisation.

"By pressing this issue the US is not seeking a back door toward protectionism. On the contrary we're seeking the front door toward a more liberalised trading regime worldwide," he said.

Members of the Association of South-East Asian Nations (Asean) have decided formally to oppose any such moves on workers' rights at the Singapore meeting.

Radio enthusiasts bank on Ariane 5

By Michael Skapinker, Aerospace Correspondent

Among those hoping for a speedy recovery of Europe's space programme after last week's fiery Ariane 5 failure are thousands of amateur radio enthusiasts, who fear they may soon be deprived of high-quality satellite links.

Amateur radio users around the world have raised \$3m to build their own satellite, which was due to be launched later this year on an Ariane 5 rocket.

Mr Ron Broadbent, 71, a veteran London-based radio enthusiast who is co-ordinating the international fund-raising effort, said an early resumption of Ariane launches was urgently needed by the elite band of radio operators who use satellite rather than terrestrial links to communicate with one another.

Mr Broadbent said that 10,000 of the 1.25m amateur radio enthusiasts operators worldwide had the necessary equipment to communicate by satellite.

There are several low-altitude amateur radio satellites in orbit, some with cameras that transmit pictures back to earth, which can be picked up on personal computers linked to radio equipment.

But it is the two existing high-altitude satellites, Oscar 10 and 13, which provide radio

users with the ability to communicate for longer periods and with other users further away.

Oscar 13 is expected to re-enter the earth's atmosphere and burn up in December. Oscar 10 has been in orbit since 1983 and its computer memory is failing, as are its solar rechargeable batteries.

The planned successor to the Oscar satellites, Phase 3D, is intended to provide radio users with better sound and pictures than they have had before.

Made up of components built in 14 countries, the satellite is being assembled in Orlando, Florida, from where, if all goes well, it will be shipped to French Guiana for launch by Ariane.

Its transmitters will be more powerful than those on earlier satellites. A set of spinning wheels on Phase 3D will re-orient the satellite in orbit so that its antennas always point towards the earth. On Oscar 10 and 13 the antennas sometimes point towards space, making communication difficult.

Mr Broadbent said he did not know whether insuring Phase 3D would be more costly after the Ariane failure.

Mr Bill Tynan, president of the US amateur radio satellite organisation, said that with the know-how acquired by the enthusiasts a second satellite could be built for \$500,000 or less.

European leaders will be looking for flexibility in Washington

Trade to dominate US summit

By Lionel Barber in Brussels

EU leaders arrive in Washington for a bi-annual summit today, likely to be dominated by trade, especially European concerns about US legislation on Cuba.

The European team, headed by Mr Romano Prodi, the new left-wing Italian prime minister, will be looking for signs of flexibility from President Clinton who has been a steady retreat from multilateral trade negotiations in the run-up to the November presidential election.

The Washington summit is the first since the US and EU signed an ambitious accord last December to strengthen trade and political co-operation in the post-cold war era. Meanwhile, a series of brush-fire disputes have overshadowed the good intentions outlined in the transatlantic dialogue.

- The EU is fiercely opposed to the Helms-Burton Act which provides for legal actions against foreign companies with investments in Cuba. Sir Leon Brittan, EU trade commissioner, who will be attending the summit, called the act extra-territorial and in breach of the US's international obligations.
- The EU is worried about pending legislation sponsored by Republican Senator Alfonse D'Amato of New York relating to trade with Iran and Libya,



President Clinton: retreat from multilateral negotiations on financial services, telecommunications and maritime trade

judged to be rogue states by the US. Europeans, which have close commercial ties with Iran, favour a critical dialogue.

- The Europeans are unhappy about US pressure to renew the US-Japanese semiconductor trade agreement which expires in late July and which Brussels judges to be discriminatory.
- The US has withdrawn from

multilateral trade negotiations on financial services and telecommunications, and is about to pull out of talks on maritime shipping.

The EU hopes that after the November election, the new administration will regain its margin of manoeuvre and be an active player ahead of the Singapore ministerial meeting in December, the most impor-

tant trade summit since the end of the Uruguay Round.

Commission officials said this week that the EU would not wish to put too much pressure on the White House before the election. "We just need a signal that they understand our problem."

One option is to ask Mr Clinton to grant a waiver of Title Three of the Helms-Burton Act, thus allowing foreign investors to deal in Cuban buildings and property. Mr Clinton must exercise this right by July under the law.

Despite the trade friction, EU and US officials in Brussels stress that the underlying relationship remains solid. Last week's Nato summit in Berlin signalled an important step towards accommodating the European desire for a more prominent role in a reshaped alliance.

In Bosnia, the US and Europe are co-operating on the Nato peace-keeping mission and civilian reconstruction.

Commission officials said it was too early to assess the broader transatlantic agenda which commits it to 180 joint actions on issues ranging from lifting barriers against Palestinian exports from Gaza and the West Bank to an early warning system for tracking killer viruses, and organising humanitarian aid to Africa and the Caucasus.

D-Mark	6.66	(6.32)
Escu	6.80	(6.30)
French franc	6.67	(6.67)
Guillem	5.85	(5.80)
up to 5 years	6.75	(6.75)
5 to 8.5 years	7.55	(7.55)
Italian lire	6.75	(6.41)
Yen	3.40	(3.40)
Peso	8.53	(8.64)
Sterling	6.66	(6.55)
Swiss franc	5.25	(5.05)
US dollar for credits	7.27	(7.11)
up to 5 years	7.48	(7.38)
5 to 8.5 years	7.86	(7.48)
Belgian franc	7.42	(7.38)
Australian dollar	9.81	(9.40)
Irish punt	7.84	(7.54)

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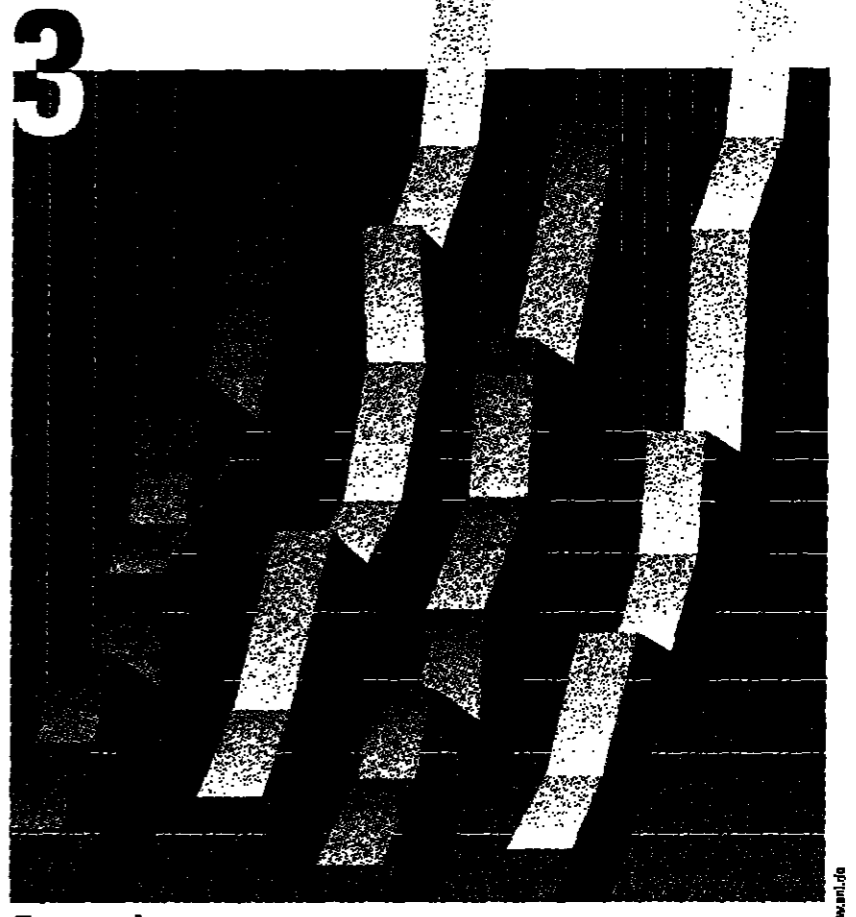
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Siemens Nixdorf: User Centered Computing

Television/Christopher Dunkley
This is the house that Birt built

Those on the guineas of the BBC have always been pretty gloomy about the direction and methods adopted by the officers on the poop deck. But this week the clouds of doubt and fear hanging over many BBC offices are thicker than they have been in 25 years as staff struggle to come to terms with the latest plans for reforming the corporation.

commercial television system. Birt was known as a keen broadcasting theorist as well as a programme administrator and was, it was widely believed, recruited to the BBC at a high level in a deliberate attempt to inject non-corporation thinking and modern management techniques. His chairman at LWT was Sir Christopher Bland, who has recently been appointed chairman of the BBC, and it was Bland who announced last Friday that his old colleague, Birt, had agreed to extend his contract and remain as BBC director-general until the year 2001.

arrangement much more like that adopted by Channel 4 and subsequently by ITV - something like the system used by book publishers, with the creative side operating separately from administration.

words efficiency, resources, focus and the rest of the clichéd lexicon of management analysis sound the death of Birt's BBC. From now on, this is the house that Birt built, and it will be extraordinary if it lasts for a fraction of the 75 years that Birt's did.

and for generating commercial income; BBC Resources providing programme support services; and The Corporate Centre which will handle strategy, policy and so on.

general and the heads of the six new divisions plus the directors of personnel and finance.

approaching, even if it is not approaching quite as fast as people have been telling us for the past 25 years. Changes in broadcasting have always been driven (from radio to television, monochrome to colour, the coming of viewer control via the video recorder, wider choice thanks to satellite and cable) and one way or another there will be even more major expansion and change during the next 20 years.

In Talking Heads, Alan Bennett's marvellous talent for satire - charitable, malicious, ironic, funny, touching, infinitely subtle, wholly English - is at its height. Yet, however interesting Bennett is here and though here he is at his best, Maggie Smith is yet more so.



Margaret Tyzack (left) and Maggie Smith: splendidly right for Alan Bennett's infinitely subtle, wholly English satire



Medieval view of the Old Testament

Part of what is touching and impressive about the mystery plays staged in York is, surely, what was always touching and impressive about them when they were first presented there in the late medieval era. Presented as they used to be by the city's guilds, they involved a large community of amateur performers in a community project that was both serious and splendid; and that is still true today, when they are presented for one season every four years.

fall" and (Christ at the Last Supper) "This is my cross, no common crust" abound; the angels dance and play musical instruments. And yet many of these devices are brought up to date. The violins that the angels play are not period instruments, but modern; Herod says such kindness as me owe"; and we see people in modern dress putting on "period" robes before our eyes. (Here and there, this is taken to excess. The Virgin Mary as a hospital nurse in a white uniform ending above the knees looked unfortunately naïf.) Pontius Pilate wears a purple drape over an orange trouser suit.

Theatre/Alastair Macaulay
Supremely cast 'Talking Heads'

the first time, the joy of sex and then the odyssey of totalitarianism. And the solo surpasses almost all Bennett's other work because Susan shows the full moral sense of her own dilemma. Mendacious, hypocritical, irreligious though she is, Susan is deeply concerned in her unhappy way with honesty, with religion and with self-fulfilment.

lapsed, as if portrayed by Picasso - but everything is brisk, laconic, and often wonderfully ambiguous. Our other two supreme actresses, Judi Dench and Vanessa Redgrave, are not Bennett types because they excel in the very largeness of soul and vitality of temper which are alien to his spirit. But Smith is ideal for his writing because she combines both his charity and his malice, and because her skill in acting is like that of a surgeon, laying bare the crucial details of a character's mental anatomy.

me; and he does too little to create a world beyond entertaining us with the virtuoso satire of his vision. As an aristocrat of Britain in decline, he is superb, and in Talking Heads, he gives brilliant vehicles to both Tyzack and Smith. Yet, though they show him at the top of his form, he does not show them at the top of theirs. Tyzack has a vehemence, Smith a lyrical grandeur, that Bennett cannot express.

work by Philip Webb, Norman Shaw and C.F.A. Voysey; to Sep 29

INTERNATIONAL ARTS GUIDE

- ATLANTA
EXHIBITION
High Museum of Art
Tel: 1-404-733-4400
● Picturing the South, 1863-1996: this photography exhibition examines the facts, contradictions and myths that have shaped the cultural heritage and psychological identity of the South of the US, and the influence they have exerted on the imaginations of artists for more than a century; Artists represented include George N. Barnard, Lee Friedlander, Walker Evans, Harry Callahan and John McWilliams; from Jun 15 to Sep 14

- BERLIN
CONCERT
Konzerthaus Tel: 49-30-203090
● Rundfunk-Sinfonieorchester Berlin; with conductor Mario Vazrago and violinist Christiane Edinger perform works by Henze, Szymanowski and R. Schumann; 8pm; Jun 14
EXHIBITION
Berlinerische Galerie - Martin-Gropius-Bau Tel: 49-30-254860
● Michael Schmidt. Fotografien seit 1965: retrospective exhibition featuring photographs by Michael Schmidt (b. 1945) from 1965 to the present. The city of Berlin, in which the artist has lived all his life, plays an important role in his work; from Jun 14 to Sep 8
OPERA
Deutsche Oper Berlin Tel: 49-30-3438401
● Le Nozze di Figaro; by Mozart. Conducted by Dorian Wilson and performed by the Deutsche Oper Berlin. Soloists include Eva Johansson, Flornuza McCarthy, Camille Capasso and Russel Braun; 7pm; Jun 13

- BONN
EXHIBITION
Kunst- und Ausstellungshalle der Bundesrepublik Deutschland Tel: 49-228-3171200
● Wisdom and Compassion. The Sacred Art of Tibet: this exhibition focuses on the traditional themes of the art of Tibetan Buddhism and presents the important stylistic developments from the 9th to the 19th century. On display are 190 objects of sacred art, mainly scroll-paintings (tangkas) and ornate metal sculptures, but also application work and tapestries as well as wooden, ivory and stone sculptures with a strong religious expression; to Aug 25

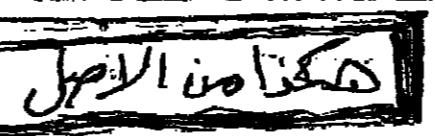
- HAMBURG
DANCE
Hamburgische Staatsoper Tel: 49-40-351721
● Hamburg Ballet: perform a choreography by John Neumeier to Mahler's Symphony No.9. Soloists include Janusz Mazna, Bettina Beckmann and Anna Grabka; 8pm; Jun 14

- LONDON
CONCERT
St. John's, Smith Square Tel: 44-171-221081
● BBC Singers and the Matrix Ensemble; with conductor Robert Ziegler perform works by Copland, Cage and Feldman; 7.30pm; Jun 14
Wigmore Hall Tel: 44-171-8362141
● John Rodgers; accompanied by pianist Roger Vignoles. The soprano performs songs by R. Schumann, Poulenc and Rosenzweig; 7.30pm; Jun 13

- LUBECK
CONCERT
Musik- und Kongresshalle Tel: 49-451-7904115
● NDR Sinfonieorchester; with conductor Sir Georg Solti perform Beethoven's Symphony No.3 (Eroica), and the NDR Chor perform Brahms' Motets Op.29, No.2 and Op.74, No.1, and Schoenberg's Friede auf Erden, Op.13; 8pm; Jun 15

- PARIS
CONCERT
Maison de Radio France Tel: 33-1-42-30-22-22
● Orchestre Philharmonique de Radio France; with conductor Arturo Tameyo perform works by Petrusli, including Concerto for Orchestra No.8, and Stravinsky's Apollo Musagettes; 8pm; Jun 13

WORLD SERVICE
BBC for Europe can be received in western Europe on medium wave 648 kHz (463m)
EUROPEAN CABLE AND SATELLITE BUSINESS TV
(Monday to Friday)
NBC/Super Channel
07.00 FT Business Morning
10.00 European Money Wheel
Nonstop live coverage until 15.00 of European business and the financial markets
17.30 Financial Times Business Tonight
CNBC:
08.30 Squawk Box
10.00 European Money Wheel
18.00 Financial Times Business Tonight



COMMENT & ANALYSIS

FINANCIAL TIMES

Number One Southwark Bridge, London SE1 9HL
Tel: +44 171-873 3000 Telex: 922186 Fax: +44 171-407 5700
Wednesday June 12 1996

Competition in the clouds

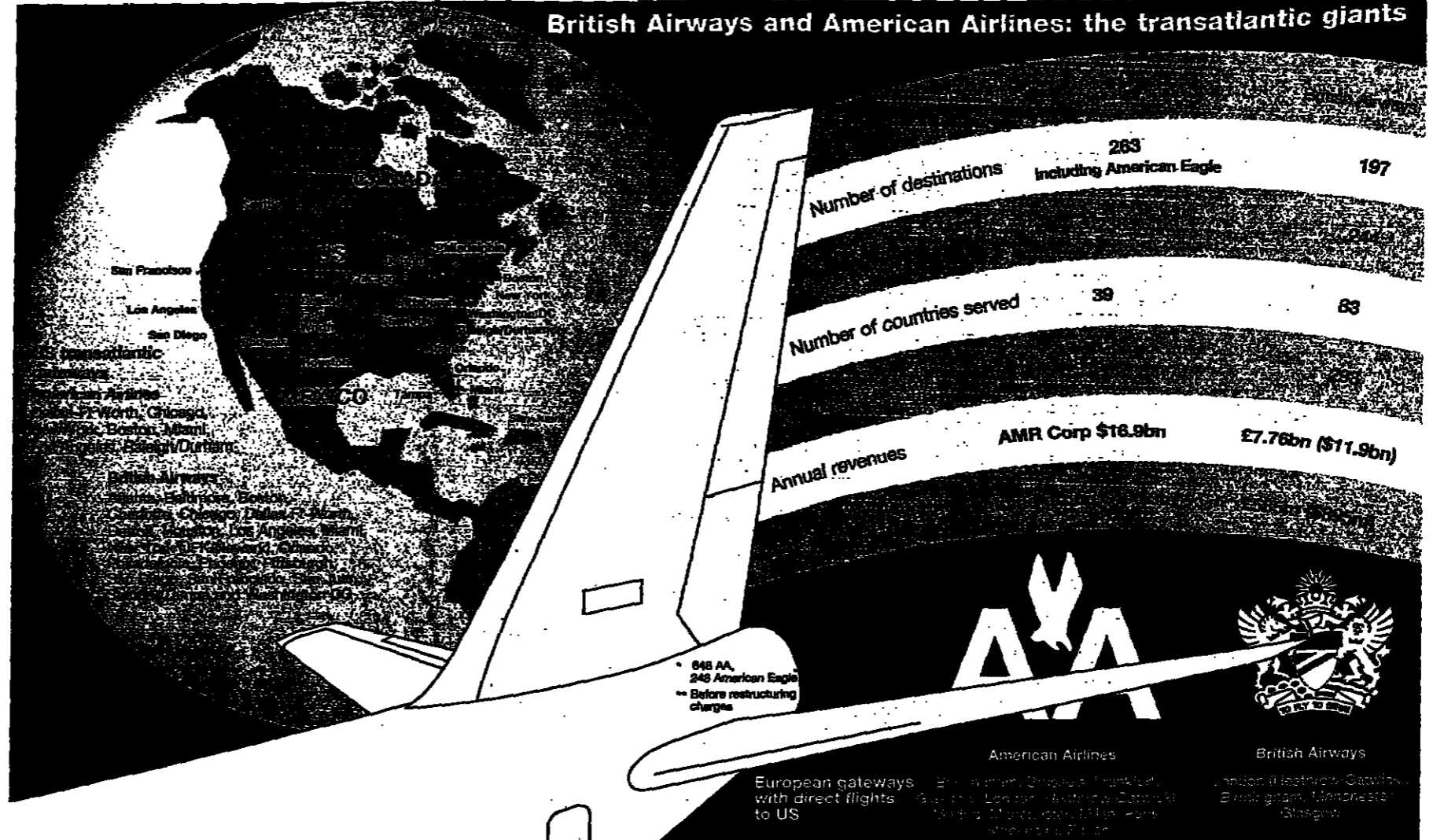
The proposed alliance between British Airways and American Airlines is a landmark event. As the aviation industry's biggest international link-up yet, it is important both in its own right and because it is likely to stimulate similar deals between other carriers.

Better schools

Education policy in England has reached a curious pass. Both main parties see votes to be won on the state of England's schools and are madly jostling for advantage.

Job jitters

The much-ballyhooed rise in job insecurity among the developed world puts sitting governments in a bind. If leaders ignore the issue, voters - especially middle-class ones - will judge them insensitive and out of touch.



British Airways and American Airlines: the transatlantic giants

A day for eating words

The two airlines in yesterday's partnership have had to abandon long-held positions to forge their alliance, says Michael Skapinker

The alliance between British Airways and American Airlines, announced yesterday, left some smaller rivals angry and worried about the competitive challenge. BA and American will be a powerful force. They together control 60 per cent of flights between the UK and the US, 70 per cent of traffic between London and New York, 90 per cent between London and Chicago and all flights between London and Dallas.

To conclude the deal, however, BA had to drop its opposition to a UK-US open-skies agreement. The US said anti-trust immunity would be granted only to airlines from countries which had concluded open-skies agreements. Yesterday BA and American said they would ask for anti-trust immunity and called on the UK and US governments to negotiate a new, liberalised aviation agreement to replace Bermuda II.

OBSERVER

Case of the missing veto

Quizzing when the British government will block EU business is enough to test the patience of any diplomat. President Chirac, a staunch ally of the Chancellor Kohl in the last year, is under fire from opposition socialists, so it was time for a concession.

No contest

In German employers' leader Klaus Muhsen has given way at the 1970 hour and spared Unice, the European employers' federation, the novelty and embarrassment of a contested vote for its new leader.

Our friend Gerry

Expanded to may be from the peace talks, but Gerry Adams continues to get an ambulatory press in the US. The New York Times dubbed him the "Duke of the South Seas" in a 1999 interview.

Set of one

Just as will the formation of a coalition of British and German politicians and publishing companies was off to a slow start.

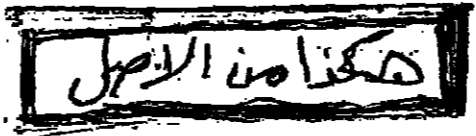
Financial Times

100 years ago

New Zealand Prosperity Wellington: Parliament was opened to-day with the usual ceremonial. In his speech, the Governor said the finances of the colony continued to be sound, and there was a substantial surplus of revenue over expenditure.

50 years ago

New Head of US Treasury Mr. Vinson has now been transferred from the Treasury to the Supreme Court and has acquired during his relatively brief period of office a reputation for hard bargaining.





Warmth and wit mark Dole's Congress exit

By Jurek Martin in Washington

If only the other 99 senators could have voted, Bob Dole would have been elected US president yesterday by acclamation. Instead, in an occasion marked by sentimentality, reminiscence and humour, he took leave of the US Congress, his professional home for the last 35 years...

and Rayburn. But the little terrace outside the majority leader's office, which he calls "the beach", will be officially known as the "Robert J. Dole Balcony". In the beginning, he could hardly get a word out. His voice cracked, he sniffed and pressed his thumb against his lips as if to stifle them.

Carolina boasted that he held the record for filibustering (24 hours and 18 minutes). Mr Dole quipped: "That's why you're seldom asked to be an after-dinner speaker." Mr Dole is not leaving the Senate to run for president on quite the successful note he would have liked.

GM halts Indonesia move over national car policy

By Manuela Saragosa in Jakarta and Haig Simonian in London

General Motors, the world's biggest carmaker, has frozen investment plans in Indonesia until it receives "clarification" about the government's controversial national car policy. The announcement yesterday by Mr Donald Sullivan, head of GM's Asian and Pacific Operations, marks the strongest criticism yet of Indonesian plans by a top executive of an international car company.

GM has invested \$110m in Indonesia, where it owns 60 per cent of a joint venture with PT Garmak, a local assembler. The Indonesian government has granted significant tax and tariff concessions to PT Timor Putra Nasional, a local company, to develop a "national" car.

Mr Sullivan said GM had been very disappointed with developments in Indonesia's car project. "We have put our future investment on hold... because we want to get a better understanding of where the Indonesian government is heading on their policy," he said.

Mr Sullivan did not indicate the scale or nature of the expansion being put on hold. However, industry sources said GM may have been considering raising output or widening its Indonesian model range. GM's joint venture, which started producing Opel Vectra cars in 1994, now builds Opel Astra cars and Opel-based versions of the group's US Blazer sports-utility vehicle.

China plans convertible yuan to boost business confidence

By Peter Montagnon, Tony Walker and John Riddling in Beijing

China aims to make its currency convertible by the time it hosts the International Monetary Fund meeting in Hong Kong next year, the head of its central bank said yesterday. This would allow anyone doing business with China, or within it, to convert domestic earnings into foreign exchange or back, for any purpose other than investment.

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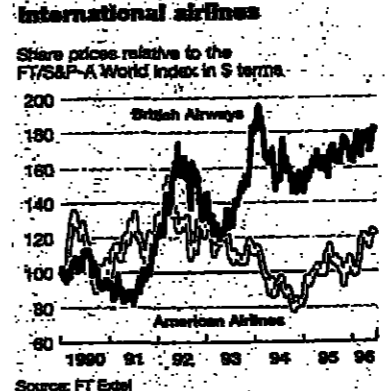
hold foreign exchange and trade it freely with banks. Currently available in four centres - Shanghai, Shenzhen, Dalian and Jiangsu province - the scheme would be expanded to other regions, he said. From July the central bank also aimed to increase the amount individuals may buy from banks.

Transatlantic tricks

THE LEX COLUMN

From the muted reaction of British Airways' and American Airlines' share prices, you would be hard pressed to spot that they were setting about creating the world's most daunting airline partnership. Of course, the shares have already had a modest run in anticipation of a deal.

FT-SE Eurotrack 200: 1730.8 (+7.8)



been developing equities trading in the US organically and bought in mergers and acquisitions expertise with its recent Gleacher acquisition.

BA is paying a price: its implicit offer of an "open skies" agreement letting US airlines into London's Heathrow. That BA can play this card, effectively blackballing the US into approving a deal which has dismal implications for competition, reflects pretty badly on the British government.

NatWest

Under the circumstances, National Westminster Bank made a reasonable job of justifying its purchase of Greenwich Capital yesterday. But when investors are hoping for a share buy-back, the acquisition of a bond trading house in a foreign market is bound to be a hard sell.

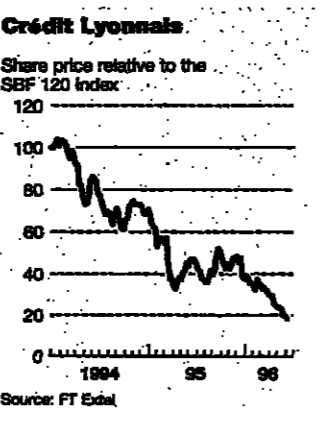
News International

Profits are only just recovering from the devastating price war, but UK newspapers are back in fashion. Two months after Mr Conrad Black's Hollinger paid £280m to take full control of the Telegraph, Mr Rupert Murdoch's News Corporation is spending just over £500m to sweep up the minority holdings in its News International arm, which owns the Times and Sun titles.

Italy taxation Crédit Lyonnais loan

Continued from Page 1

would be amalgamated into a new regional tax to be collected from every taxpayer, not just from companies. Mr Visco also hopes his outline proposals will meet some of the demands of federalists and separatists in the north, led by the Northern League, which wants to secede from the poorer south of the country.



Continued from Page 1

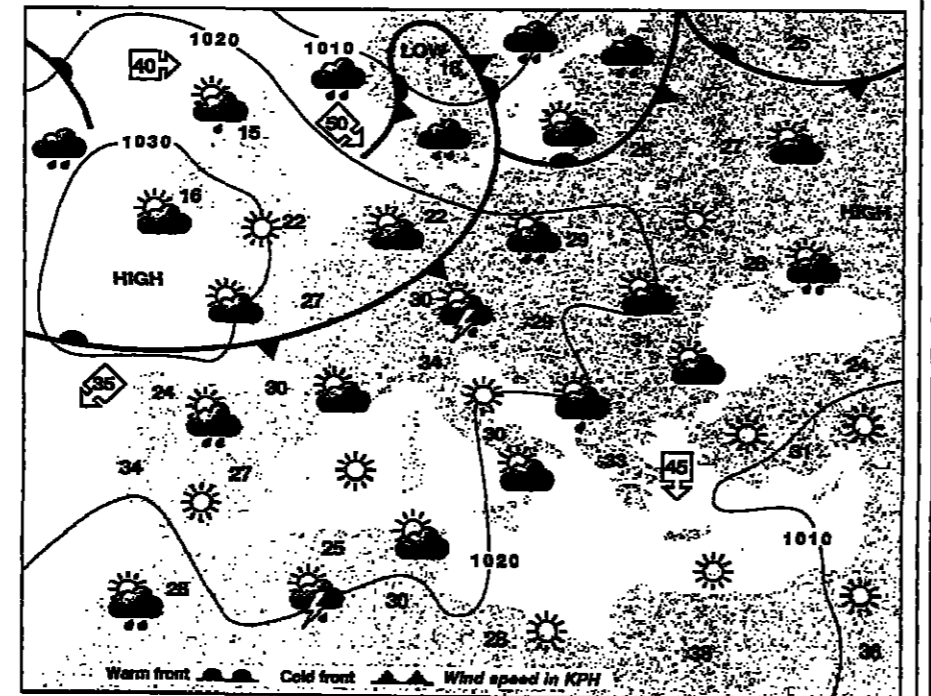
suggested that Crédit Lyonnais could report losses of up to FF900m for 1996. Its net financing costs for the state-backed rescue plan during the current year will be about FF30m.

GM in talks with UAW, Page 6

FT WEATHER GUIDE

Europe today

The British Isles will have more sun and lighter winds than yesterday but temperatures will not be much higher than 15C-20C. The boundary of hot air in eastern and central Europe will push across eastern Germany and central France. Near this boundary, variable cloud will produce rain and thunder showers in many regions.



Five-day forecast

Cooler air will spread over northern and central Europe as it circulates around an active low pressure system over Scandinavia. Central Europe will have scattered rain and thunder showers on Thursday, followed by sunny and dry conditions.

Table with columns for city names and weather forecasts for today, tomorrow, and the day after. Includes cities like Madrid, London, New York, and Sydney.

Lufthansa logo and text: "No other airline flies to more cities in Eastern Europe."

Deutsche Morgan Grenfell advertisement for repo services. Text includes: "Global leaders in securities financing and matched book repo", "a commercial bank", "a trustee bank", "a strategic approach".

Vertical text on the right edge: "DAP in FFR3 property loc"

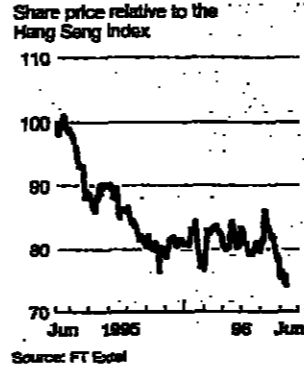
COMPANIES AND FINANCE: ASIA-PACIFIC/INT'L

Hongkong Telecom stock hurt by stake sale unease

By Louise Lucas in Hong Kong

Shares in Hongkong Telecom slid yesterday after Monday's sale by Citic Pacific, the Hong Kong-listed arm of Beijing's main domestic and international investment vehicle...

Hongkong Telecom



Share price relative to the Hang Seng Index

than it was two days ago.

Hongkong Telecom's perceived vulnerability was highlighted by a recent ownership shake-up in the aviation sector. That deal, approved on Monday...

Many analysts believe the heavily UK-controlled Hongkong Telecom will have to undergo a similar reshuffle to prepare it better for Hong Kong under Chinese rule next year.

Brokers say China's involvement in a strategic industry sector like telecoms will be a priority for Beijing.

Brokers, however, said the gloomiest prognosis was not for Hongkong Telecom, but for Cable and Wireless, the UK telecoms group which holds 88 per cent of Hongkong Telecom...

Teva set to restructure debt

By Julian Ozanne in Jerusalem

Teva Pharmaceutical Industries, Israel's largest drug manufacturer, yesterday signed a syndicated loan worth US\$70m to restructure its debt profile and increase its exposure to Europe...

maturity of five years and would pay an interest margin of 44 basis points above Libor. It said the facility had been well received in syndication, closing oversubscribed.

banks and European markets. Teva last year bought Biogal Pharmaceutical Works of Hungary, a drug and chemical producer...

Mr Susskind said the main purpose of the loan, which improved the terms of a previous loan arranged by UBS, would be to restructure Teva's debt to increase the long-term element in the balance sheet...

UBS said the loan had a maturity of five years and would pay an interest margin of 44 basis points above Libor. It said the facility had been well received in syndication, closing oversubscribed.

The company hopes to expand in Europe, which accounted for just 12 per cent of sales in 1995. Mr Susskind said Teva was confident that Copaxone, its first innovative drug for the treatment of multiple sclerosis...

Housing industry downturn hits Email

Email, the Australian appliance, building and industrial products group, has blamed a downturn in the housing industry for a 40 per cent fall in profits before tax and abnormal items in the year to end-March.

Email, which accounts for more than 40 per cent of the white goods market in Australia, said profits had been hit by a sharper-than-expected decline in new housing starts...

Go-ahead for Australian rescue

Shareholders in Australia, the Australian satellite pay-TV operator, yesterday approved a \$200m 'rescue' financing package, which involves Mr Kerry Packer's Publishing & Broadcasting group becoming associated with the company for the first time.

BankWest 'on course'

BankWest, the Perth-based regional bank controlled by Bank of Scotland, said yesterday it was still aiming to achieve profit forecasts made for the year to end-February 1997 despite the outbreak of a 'home loan' war.

Toshiba to trim chip output

Toshiba has joined other Japanese chipmakers in cutting plans for production of mainstream 16-megabit DRAM computer chips, amid a weak market and tough price competition.

Manila cautious on Hopewell power play

Hopewell Holding's decision to spin off its Philippine power plants into a separate infrastructure subsidiary to be listed on the Philippine stock exchange has been greeted with caution in Manila.

A similar roads and transport package is to be spun off from Hopewell in Hong Kong, again, the new vehicle has been valued at a price considered overly aggressive by the investment community.

Telegraphing his intent to bring Cepa Philippines to the market within 10 months is the next step - though most Hong Kong-based analysts doubt it will come any earlier than 1997.

Analysts, who point out it would be the first 'pure power play' to be listed on the local exchange, say it is too early to assess the IPO without pricing or free-float details.

The spin-off is part of Mr Wu's master plan for his roads, transport and power plant empire and, more important, for the financing of that empire.

Mr Wu has not indicated the make-up of the Philippines Cepa subsidiary, and it is unclear if it will include Hopewell's non-power Philippine infrastructure projects, notably the planned 10.9bn peso (US\$416.5m) toll-road linking Manila to Pagbilao...

Cepa is to be followed by this year's proposed listing of Hopewell (Thailand), which is aiming to raise some Bt15bn (US\$1.5m), or HK\$4.5bn. This is being raised by the IPO at an aggressive Bt50bn, will hold 70 per cent of the Bangkok Elevated Road Rail System project.

The merits of the IPO, as Mr Wu sees it, are twofold: it earns him goodwill and a more prominent position in the country, improving his company's profile with regulators, and it enables him to raise cash where it is being spent.

But the strategy has its flaws. Mr Wu's credibility with fund managers and investors in Hong Kong is evaporating; investors are losing patience with Hopewell's high gearing, and the problems which have beset many of its big projects.

In the Philippines, Mr Wu has identified two obstacles to be cleared before Hopewell goes ahead with the flotation. First, the government will

have to resolve Cepa's complaints about its disqualification from the first round of bidding last year for a 1,200MW gas-fired plant in Batangas.

In spite of the controversy, Hopewell - and Mr Wu in particular - can bank on political goodwill in the Philippines. The company was instrumental in solving the Philippines' chronic power shortages in 1993. The end of that 'brown-out' was one of the first achievements of the administration of President Fidel Ramos, and it was Mr Ramos who formally opened the Pagbilao plant on Monday.

Edward Luce and Louise Lucas

ETBA FINANCE S.A. FINANCIAL AND ECONOMIC SERVICES S.A. (formerly GREEK EXPORTS S.A.) ANNOUNCES

A REPEAT INTERNATIONAL PUBLIC AUCTION FOR THE HIGHEST BIDDER FOR THE SALE OF THE ASSETS OF ALEKAS & BROS. TEXTILE CO. S.A.

ETBA FINANCE S.A., established in Athens at 1 Eratosthenous Street, in its capacity as special liquidator of the above company now under special liquidation in accordance with article 48a of Law 1822/1960, by virtue of Decision No. 1167/5195 of the Athens Court of Appeal and following the relative instructions of the creditors

ANNOUNCEMENT

A repeat International public auction for the highest bidder with sealed, binding offers for the sale of the assets of ALEKAS & BROS. TEXTILE CO. S.A. either as a whole or per each of the following functional units:

- 1. A factory in the Antikalamata Community of Messinia (5 km. from the centre of the town of Kalamata) which includes a plot of land 61,500 sq.m. in area on which a building of 22,000 sq.m. has been erected and in which a cotton spinning factory with a capacity of 25,382 spindles, yarn spinning and dyeing plants have been installed with necessary storage space.
- 2. A factory on 10 Korymbonou Street in Kifissia which includes a plot of land 10,572 sq.m. in area on which a building 13,000 sq.m. in area has been erected and in which a weaving plant and a dyeing and finishing plant for woven fabrics, a printing-plant and a finishing plant for woven fabrics have been installed together with the necessary storage space.

ACTIVITY AND BRIEF DESCRIPTION OF THE COMPANY In 1960, the brothers Athanasios, Ioannis and Fofos Lakas founded A. LEKAS & BROS. O.E. which in 1970 became a societe anonyme (S.A.) and which in 1972 absorbed G. LEKAS & CO. O.E. in 1987 it merged with MESSINIA SPINNING S.A. to produce a new S.A. with the name A. LEKAS & BROS. TEXTILE CO. S.A. with the object of manufacturing and selling accessible natural, synthetic and artificial fibres for spinning, weaving, knitting, dyeing, finishing and clothes manufacturing.

TERMS OF THE ANNOUNCEMENT

- 1. The present Auction shall be carried out in accordance with the provisions of article 48a of Law 1822/1960 as complemented by article 14 of Law 2000/1991 as in force today, the terms contained in the present Announcement and the terms contained in the relative Offering Memorandum regardless of whether or not they are repeated in the present Announcement. The submission of a binding offer implies acceptance of all these terms.
- 2. Each interested party is invited to receive from the Liquidator the detailed Offering Memorandum and ask for any other information concerning the company under liquidation following a written promise of confidentiality.

For any further information and for the Confidential Offering Memorandum, ETBA FINANCE Financial and Economic Services S.A., 1 Eratosthenous Street, 4th floor, Athens, Greece Tel. (001) 726.0210, 726.0278 and 726.0506. Fax: (001) 726.0884

Table with 3 columns: Name of Company, Dividend No., Amount per share (cents). Lists companies like Driefontein Consolidated Limited and Kloof Gold Mining Company Limited with their respective dividend details.

Dividend No. 24 of 145 cents per preference share for the six months ending 30 June 1996 has today been declared in South African currency, payable to preference shareholders registered in the books of the company at the close of business on 28 June 1996.

LEGAL NOTICES

In the High Court of Justice No. 00190 of 1996. IN THE MATTER OF SECURITY SERVICES PLC and IN THE MATTER OF THE COMPANIES ACT 1985. NOTICE IS HEREBY GIVEN that the Order of the High Court of Justice (Chancery Division) dated 5th June 1996 confirming the reduction of the capital of the above-named Company from £20,000,000 to £16,400,331 and the Mitros approval of the Court showing with respect to the capital of the said Company as altered the several particulars requested by the above-named Act were registered by the Registrar of Companies on 7th June 1996.

U.S. \$250,000,000 CHALLENGE BANK Challenge Bank Limited. Floating Rate Notes due 1997. In accordance with the provisions of the Notes, notice is hereby given that for the Interest Period from June 12, 1996 to September 12, 1996 the Notes will carry an interest rate of 5.95156% per annum.

In the High Court of Justice No. 001952 of 1996. IN THE MATTER OF SECURITY SERVICES PLC and IN THE MATTER OF THE COMPANIES ACT 1985. NOTICE IS HEREBY GIVEN that the Order of the High Court of Justice (Chancery Division) dated 30th June 1996 confirming the reduction of the capital of the above-named Company from £20,745,000 to £14,043,331 and the Mitros approval of the Court showing with respect to the capital of the said Company as altered the several particulars requested by the above-named Act were registered by the Registrar of Companies on 7th June 1996.

Correction Notice. Acier Incorporated U.S. \$45,000,000 4 per cent, Bonds Due 2001. Further to the notice published in the Financial Times on 11th May, 1996 concerning the Condition 17(d) of the Bonds in respect of Redemption as the Option of the Bondholders, Bondholders are hereby advised that if they desire to exercise their option in accordance with this condition they must deposit the appropriate notice with a Paying Agent no later than 17th June, 1996 and not 17th June, 1995 as shown in the notice dated 11th May, 1996.

NOTICE CONCERNING MERGER SUMITOMO OSAKA CEMENT CO., LTD. (the "Company"). Pursuant to Clause 4(A) of the Instrument dated 22nd July, 1993 in respect of the above captioned Warrants and the rules of the Luxembourg Stock Exchange, notice is hereby given to the holders thereof as follows: (a) the Company entered into a merger agreement (the "Merger Agreement") with Sumico Kosen Co., Ltd. ("Sumico Kosen"), a subsidiary of the Company, on 26th April, 1996 (Japan time); the same is hereinafter applicable; (b) the Merger Agreement will be submitted for approval to the Ordinary General Meeting of shareholders of the Company on 27th June, 1996; (c) subject to the approval of the Merger Agreement by the shareholders of the Company and of Sumico Kosen, the Company will succeed to all assets, liabilities, rights and obligations of Sumico Kosen on 1st October, 1996 subject to the commercial registration of the merger being made with the appropriate Legal Affairs Bureau under the Commercial Code of Japan (which registration is expected to be made in December, 1996) and the Company will merge with Sumico Kosen (the continuing corporation being the Company) upon such commercial registration of the merger; (d) no cash or other property will be payable or deliverable to shareholders of the Company as a result of the merger; (e) the Subscription Price applicable to the above captioned Warrants will not be adjusted as a result of the merger; and (f) the corporate name of the Company will be unchanged as a result of the merger.

COMPANIES AND FINANCE: THE AMERICAS

EDS shares commence trading in London

By Alan Cane

Shares in Electronic Data Systems, the US based computing services group which manages many government computer systems in Europe and the US, began trading in London yesterday following their New York debut on Monday.

parent, General Motors, on June 7. Shareholders holding GM's E-class shares will receive an equivalent number of EDS shares tax free.

EDS is listing in London as well as New York to underline its rapid growth in Europe, the Middle East and Africa, where it has 19,000 staff and revenues of \$2.4bn.

split from GM would give EDS the opportunity to approach customers in the automotive and aerospace industries who might have been deterred by the group's relationship with GM and its subsidiaries.

"Year 2000" teams had been established to cope with the problem of computers and the change of date at the end of the century. Tests with customers' computers before reprogramming showed they did not necessarily stop.



John Bateman: split from GM will give EDS flexibility

NEWS DIGEST

MCI, Intel launch Internet software

MCI Communications and Intel have launched their jointly developed network MCI WebMaker software for the creation and maintenance of World Wide Web sites on the Internet and said they had formed an alliance to develop and market further Internet products and services.

Barclays to sell Canadian banking arm

By Bernard Simon in Toronto

Barclays Bank, of the UK, has agreed to sell its Canadian banking subsidiary to Hongkong Bank of Canada, a unit of Hongkong and Shanghai Banking Corporation.

Barclays has sharply scaled back its operations in Canada over the past two years, with the assets of its local subsidiary falling from more than C\$3bn (US\$2.2bn) to about C\$800m.

Barclays will retain a presence in Canada through BZW, its investment banking arm, which specialises in corporate, structured and export finance, and private banking.

Mr Graeme Hansen, president of Barclays Canada, said the sale was in line with the parent's worldwide strategy and was designed "to clear the decks so that the remaining businesses can get on with life without the distractions of the old business".

Foreign institutions have found it difficult to compete against the large Canadian banks, and several have suffered heavy loan losses.

Repsol group wins auction for Peruvian refinery

By Sally Bowen in Lima

A consortium headed by Repsol of Spain yesterday became the new owner-operator of Peru's largest refinery, La Pampilla, on the coast north of Lima.

The public auction marked the start of the long-delayed and controversial privatisation of Petroperu, the state-owned oil producer and refiner.

It underlined Repsol's eagerness to establish a firm presence in Latin America. In the past few days, the Spanish hydrocarbons conglomerate

has acquired a 37.7 per cent controlling stake in Astra, Argentina's fifth-largest energy group, for \$360m.

For its La Pampilla bid, Repsol joined forces with YPF of Argentina and Mobil of the US. Repsol has a controlling 45 per cent in the consortium - Refinadores del Peru - YPF, 25 per cent, and Mobil, 5 per cent.

At the same auction, held in Lima yesterday, Pluspetrol of Argentina, in association with two minority Korean partners, was awarded a 30-year concession to the northern jungle oil fields known as Blocks 8-X.

At the same auction, held in Lima yesterday, Pluspetrol of Argentina, in association with two minority Korean partners, was awarded a 30-year concession to the northern jungle oil fields known as Blocks 8-X.

Reserves have been established at 43m barrels by J.R. Butler of the US. Pluspetrol is committed to investing at least \$25m in developing the deposits.

In what observers described as a shut-out bid, Pluspetrol offered \$143.2m, well ahead of the \$135m, \$104m and \$98m bid respectively by China Petroleum and Technology, Perez Companc of Argentina and YPF.

Government ministers were relieved to have got Petroperu's privatisation under way after long delays. Although the state has sold off more than

\$1.5bn in state assets, securing associated investment commitments of about the same again, the proposed sale of the oil producer provoked greater hostility than any previous privatisation.

Opinion polls indicate that more than 80 per cent of Peruvians oppose Petroperu's sell-off and especially its division into separate units.

According to Peruvian officials, Petroperu will be wholly privatised by the middle of next year. The government is expecting to net \$1.2bn from the various sales.

Microsoft in Internet shopping buy

By Louise Kehoe in San Francisco

Microsoft yesterday announced the acquisition of eShop, a pioneer in the field of Internet shopping software, best known for its Internet shopping centre, the eShop Plaza. Terms were not disclosed.

The move reflects Microsoft's ambitions to dominate the Internet software field, by overtaking Netscape Communications, the current market leader.

Founded in 1992 and based in San Mateo, California, eShop

has developed technology to enable merchants to set up electronic shop fronts on the World Wide Web.

It has provided software for some of the earliest Internet shops including 1-800-Flowers, a floral merchant; Tower Records, a unit of MTS; Good Guys, a consumer electronics retailer; and General Electric's GE Capital Retailer Financial Services unit, which is an eShop investor.

Microsoft said it planned to incorporate eShop's technologies into its Internet Merchant server software, aimed at

retailers. This is a critical part of a set of software programs for large commercial Internet applications.

The lack of integrated sets of electronic-commerce programming tools that provided all of the features needed by retailers had been one of the reasons for the slow development of shopping on the Internet, said Mr Paul Maritz, Microsoft group vice-president.

Mr Arnold Blinn, Mr Will Poole and Mr Greg Stein, eShop co-founders, will join Microsoft to help drive its electronic-commerce effort.

Westinghouse makes the big break

No more surprises. That was the promise made little more than two years ago by Mr Michael Jordan as he took to the platform to make his first presentation to Wall Street analysts after becoming chairman of Westinghouse Electric.

Following a string of losses as the industrial conglomerate stumbled from one disaster to another, it was a message guaranteed to go down well.

Mr Jordan now seems close to a surprising overhaul of one of the most venerable industrial names in the US. Westinghouse has not made refrigerators since the 1970s, or light bulbs since 1985. But as recently as two years ago it remained a broad-based industrial group.

On Monday, though, the former PepsiCo executive set in motion the process that could see Westinghouse emerge as a pure broadcasting and media company.

It is to Mr Jordan's credit that the latest, and possibly final, step in this transformation has come as little surprise on Wall Street.

Since the news last August that he planned to buy CBS, one of the three big US network television companies, the Westinghouse chairman has been set on repositioning the company to benefit from the growth in the television and radio business.

An attempt to diversify into a different growth industry - financial services - led to disaster and an expensive retreat in the 1990s. This time, there seems to be no going back.

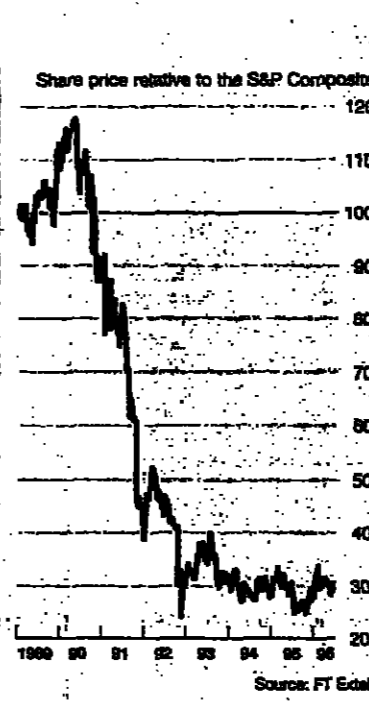
The last act in the restructuring of Westinghouse was ushered in by Monday's announcement that the group was exploring ways to separate its industrial and broadcasting businesses.

It is just seven months since the \$5.4bn acquisition of CBS was completed: Westinghouse now expects to take another

Bumpy ride



Michael Jordan chief executive officer



its real estate, office furniture and electronics operations and announced plans to close its environmental services business, leaving it with power generation, refrigerated transport and broadcasting.

Mr Jordan has started to look beyond the next step. Whatever the outcome - a break-up of the group, or perhaps separate classes of stock for its different businesses - he made clear this week that further acquisitions were likely on the broadcasting side.

Wall Street has come in recent months to look more favourably on Mr Jordan's skills as a buyer, not just a seller, of businesses. Last summer, with CBS's ratings on the slide and Disney setting the headlines with its purchase of the more successful Capital Cities/ABC, Westinghouse's purchase failed to ignite much enthusiasm.

Now, though, CBS has begun to claw its way back up in the ratings, and its recently announced autumn schedule has drawn favourable reviews. Mr Jordan has also positioned Westinghouse as owner of the country's biggest group of television stations (its 15 US households reach 32 per cent of the biggest radio station groups).

Westinghouse has now set about squeezing cash out of its new acquisitions: in the first three months of the year, operating profits from its 39 radio stations rose 25 per cent as the first benefits were realised.

Adding to the changed perception of the CBS purchase has been the timing of new US broadcasting legislation, which has since cleared the way for station owners to expand their reach. "It was a great buy," Mr Heymann says. "They understood the change in the legislative environment before it was effected."

Richard Waters

All of these securities having been sold, this advertisement appears as a matter of record only.

12,650,000 Shares
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Class A Common Stock
(No par value per share)

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June 1996

GE Capital, El Paso Energy Corporation, INTERGEN, GRUPO ICA
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\$515,000,000 Debt Financing
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A 700 MW gas-fired, combined cycle power plant
The first privately funded power project in Mexico
Commercial Operation: 1999
\$132,000,000 Equity Investment
Co-Arrangers: GE Capital Markets Group and International Generating Company
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GE Capital Services, El Paso Energy Corporation, International Generating Company, ICA

BUSINESS AND THE ENVIRONMENT

While many governments are worried by the levels of pollution caused by fossil and nuclear fuels, efforts to harness solar energy often put forward as the best of the alternative energy sources - as a leading power source have proved disappointing.

That may be about to change. Australian scientists are developing solar cells that are both extremely cheap and efficient and have the potential to produce electricity at rates which are lower than with existing fuels.

Martin Green, a professor at the University of New South Wales in Sydney, and his team at the Centre for Photovoltaic Devices and Systems have been developing more efficient solar cells since 1975. In 1986 they made a significant breakthrough when they produced the buried grid technology which uses conductor strips buried within the cell to collect the generated electricity. Previously, the conductor strips lay on the surface of the cell.

That change resulted in an increase in efficiency of 10 percentage points and the technology has since been licensed to most of the biggest cell manufacturers in the world. BP Solar has used it in many important installations including the world's most efficient photovoltaic electricity-generating systems.

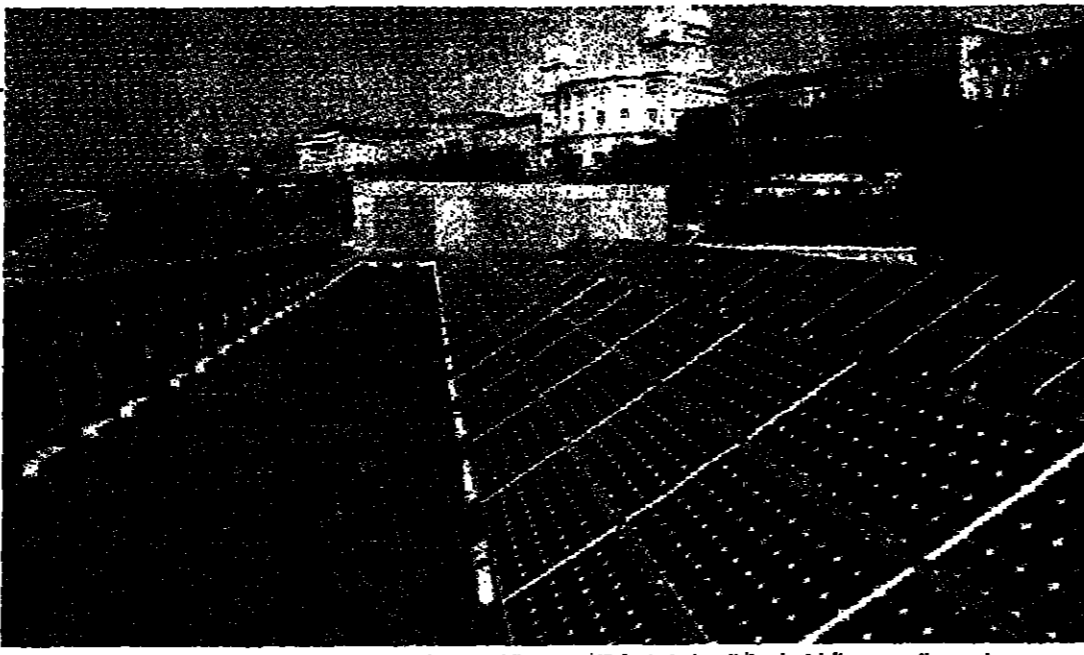
The centre has remained at the forefront of solar research and by 1995 was producing cells with an efficiency of 24.5 per cent, where almost one quarter of the light-energy falling on the surface is converted into electricity. However, it is the solar cells currently under development which show the most spectacular potential.

These new cells combine three important initiatives. First, a means of using extremely thin silicon layers has been developed. These cells are composed of five layers with a total depth of only 20 microns (half the thickness of a human hair) and use only one twentieth of the volume of the silicon material used in traditional single-layer cells, which have a thickness of 400 microns (0.4mm).

Because of the peculiar physical properties of light penetrating these very thin layers, inferior and much cheaper material can be used in the manufacture - in fact, material up to 1,000 times less pure than that used in existing cells. Even with this poorer material, an efficiency of 15 per cent can still be achieved.

Second, the buried grid technology has been successfully adapted to the new cells. Third, the new modules can be assembled automatically, thereby greatly reducing manufacturing costs.

These three innovations will have an enormous impact in lowering the



Parliament House in Bern, Switzerland, has one of the world's most efficient photovoltaic electricity-generating systems

Solar's warm glow

Lawrie Delroy continues a series on power from the sun with a significant breakthrough in cell production

cost of producing electricity and it is expected that by 2000 installation costs for solar-generating plants will be reduced to less than \$2 (£1.30) per watt peak (costs estimated in US\$).

An installation of one watt peak is one which produces one watt of electricity during the sunniest period of the day, usually around noon. Experience has shown that, on average, solar cells produce five watt hours of electricity per day in suitable locations for each one watt peak of installation. A generating establishment costing \$2,000, where the unit cost is \$2 per watt peak, would produce 5 kilowatt hours of electricity per day over the life of the establishment, which could be expected to be about 30 years.

Allowing for overheads, production costs for such an establishment would be less than 20 cents per kilowatt hour (or about one-third the present cost of producing solar electricity). At that level, solar energy would be more viable as a significant power source for remote areas, such as the outlying islands of Indonesia, or countries where production costs are high because of

lack of raw materials, as in Japan.

However, Green is confident that the technology being developed will be capable of much lower costs when in full production, which he expects to take a further 10 years. Present estimates are that by 2010 establishment costs will have fallen well below 80 cents per watt peak. At that price solar electricity will be a viable, economic alternative to traditional forms of electricity production in most countries.

The replacement of traditional power stations by solar ones would overcome most of the pollution problems facing the world today.

Rob Largent, the centre's spokesman, points out that "because environmental problems are expected to lead to both higher generating costs and restriction in output in the future, solar power is likely to become cost competitive at an earlier stage".

Some problems will remain with storage of solar electricity. However, these can be overcome by a range of initiatives, such as introducing variable tariff rates to encourage maximum use during daylight hours, broadening the hours of

direct availability by transmitting electricity across vast distances, and linking solar power stations to hydroelectric schemes to give 24-hour availability.

This type of linkage already exists in the supply of electricity to cities in eastern Australia - peak load power is generated by hydro-electrical stations with water pumped back up into reservoirs during the night using off-peak electricity supplied by thermal power stations.

Supporters of solar energy believe the time is right to re-evaluate its potential.

Largent is optimistic: "The multi-layer technology has the potential to bring clean and cost-effective power to the world - every day our research brings us closer to this realisation." He says that although some engineering problems remain in scaling up systems and determining exact processes for better yields, the basic research is already in place and eventual success is assured.

The first article of the solar series appeared on June 5.

Scientists in Israel have found a way to 'pipe' the sun's energy from the desert to the city, writes Thomas Land

Israeli sunshine in the pipeline

Technologists in Israel have overcome one of the biggest single obstacles to the development of solar power for industrial use by devising a process which, in effect, transports sunshine through a pipeline.

A chemical "heatpipe" system, developed by technologists at Israel's Weizmann Institute of Science, promises safe and efficient transmission of energy over long distances.

The system could break a vicious circle which has discouraged investment in solar power generation. Until large solar power plants are started, there is often no incentive to build a long and expensive electric transmission line - and few investors are prepared to build a solar plant until they have the means to get the power to market.

The system has three stages. First, solar energy collected in sunny and otherwise unproductive desert areas is concentrated and used to drive a chemical process at high temperatures.

Then the gases formed during the process are cooled and stored or transported to distant industrial centres where the energy is needed. Finally, the chemical process is reversed, releasing heat that can be used to run turbines generating electricity.

In the first part of the process, solar energy is absorbed in a special chemical reactor (reformer) where methane and other hydrocarbons are converted into synthesis gas (a gas mixture). The energy-rich mixture can be stored or sent by pipeline to the point of use.

In the third stage, the energy present in the synthesis gas is recovered by means of a methanator, a component of the chemical heatpipe, which converts it back to methane, and in the process releases heat which can be used in many ways.

The methane produced by the methanator can be returned to the solar plant to be used again for the production of synthesis gas, thus completing a closed loop system that neither uses fossil fuels nor emits gases into the atmosphere.

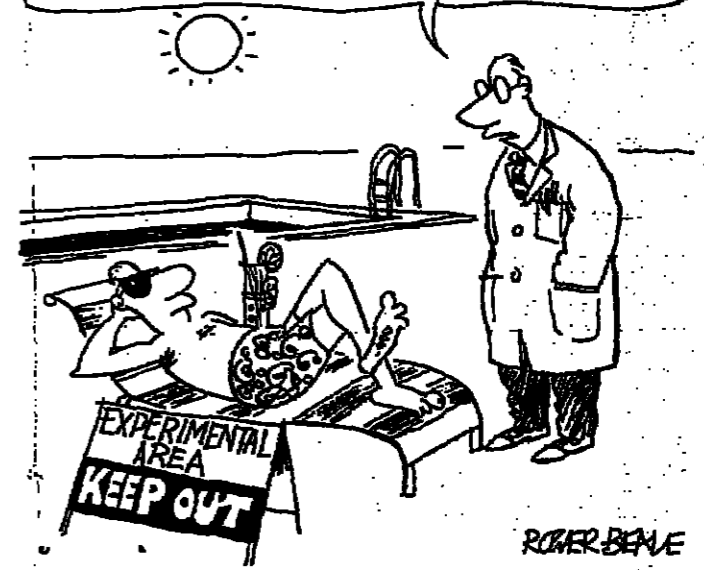
The feasibility of this concept has been demonstrated by Moshe Levy, a professor in Weizmann's materials research department. Israel's Ministry of Energy is to join the institute next year in the development of large-scale industrial application.

The chemical heatpipe is "the key to large-scale use of solar energy," says Israel Dostrovsky, the Weizmann technologist who initiated the establishment of the institute's solar research facility

controlled mirrors that track the sun and concentrate its energy on to a 54m receiving tower. It is being used in conjunction with a wide range of energy generation, storage and transport experiments. Their potential range of application is enormous.

The Weizmann solution to storing and transporting solar energy by pipeline is likely to encourage substantial further research and development worldwide. Several recent studies have concluded that

SO... WHAT PROGRESS WITH THE SOLAR RESEARCH PROJECT PROFESSOR ECKSTEIN?



and served as its first director. He explains that the process "enables one to collect the energy of the sun in places like the desert, store it and then send it by pipeline to industrial users and cities where it is really needed".

Designed by engineer Michael Epstein, who manages the institute's solar research facilities, the methanator used in the process has been built with the support of Detroit philanthropist William Davidson whose name it bears. Weizmann's solar facility comprises 64 giant computer-

solar thermal technologies should be able to provide power within a few years at costs broadly competitive with the price of electricity derived from fossil fuels.

The sheer abundance of solar energy suggests that it will be the foundation of a sustainable world energy system a century from now, observes the Washington-based Worldwatch Institute.

"If we could harness just one quarter of the solar energy that falls on the world's paved areas, we could meet all our current energy needs comfortably," it points out.

Asia-Pacific Survey advertisement listing countries like Australia, China, Indonesia, Japan, Malaysia, Philippines, Singapore, South Korea, Taiwan, Thailand, Vietnam.

Travel the Asia-Pacific business world by mouse

Now that FT Country Surveys are available on disk, you may click your way around a country's business landscape with ease. Maps, graphs, tables... case studies... economic and political news and profiles... key facts. At the touch of a button, your FT Survey becomes a portable working document.

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MARGINED CURRENCY DEALING Laurion advertisement.

The Financial Times plans to publish a Survey on Spain on Monday, June 24.

COMMODITIES AND AGRICULTURE

Copper price volatility rekindled at the LME

By Kenneth Gooding, Mining Correspondent

The Hamanaka factor returned to rekindle extreme volatility in the London Metal Exchange's copper market yesterday.

It had previously been lifted by news that LME stocks had fallen by 12,325 tonnes to 296,000 tonnes, their lowest level since the end of last year.

Wider role as assistant to the non-ferrous metal division's general manager.

Mr Ted Arnold, analyst at the Merrill Lynch investment bank, said: "The smoke on the battle field is so thick you can't see what is happening."

Some observers were surprised, however, because the metal was taken from warehouses in Hamburg and Rotterdam rather than Long Beach in California which is closer to China.

At Flemings Global Mining Group, Mr Mick Moore said that although the turmoil would take some time to die down, the ultimate direction of the copper price is a continuation of the downward trend.

The Co-op celebrates a century on the land Geoff Tansey looks at the diverse operations of, probably, Britain's biggest farming group

Mike Calvert is certainly Britain's largest dairy farmer - and probably runs the country's largest farming operation.



The operation produces 32m litres of milk a year

There is also a management training system and career structure for the staff. Size has also given them the flexibility and opportunity to experiment - and on a fairly grand scale.

Today the results can be seen across a lush valley, lined with hedges, and a series of seven fields covering a total of 150 acres, each split in half.

The hearing is being seen a test case, which may help to clarify whether past grants of pastoral leases extinguished native title rights.

COMMODITIES PRICES

Table containing various commodity price listings including Base Metals, Precious Metals, Grains and Oil Seeds, Softs, Meats and Livestock, Energy, and Precious Metals. Includes columns for item name, price, and change.

Ok Tedi copper mine damage claim settled

By Nikki Tait in Sydney

BHP, the Australian resources group, has reached an out-of-court settlement with the Papua New Guinean villagers who were suing it over environmental damage to the area surrounding the large Ok Tedi copper mine.

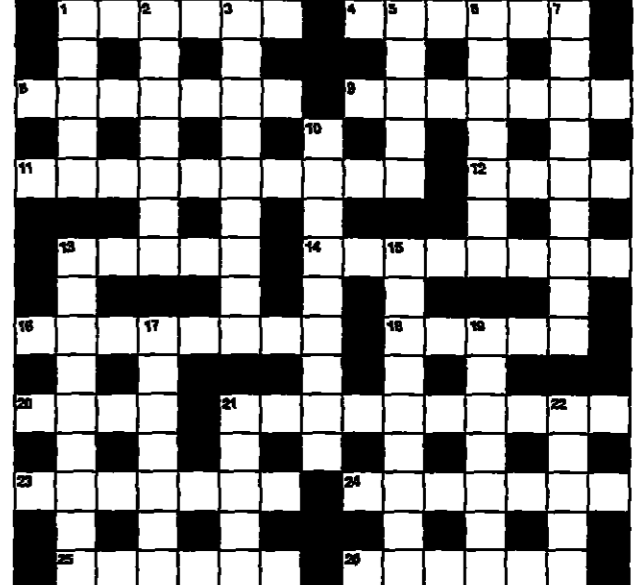
The settlement includes the "Big Australian" pay the villagers' legal costs; fund a solution to the tailings problem at the mine; and provide a "special" package of benefits for the villagers.

Table containing various commodity price listings including Precious Metals, Energy, and Precious Metals. Includes columns for item name, price, and change.

Table titled 'JOTTER PAD' containing various price listings and market data.

CROSSWORD

No.9,092 Set by GRIFFIN



ACROSS 1 Squeeze through with child (5) 2 About to polish and brush off (8) 3 Briskly slam and try to run off (7) 4 Country destroyed atmosphere, people say (7) 5 So rich models miss introducing singers? (10) 6 Waterfall (4) 7 Delivery vehicle, even with nothing in (5) 8 Master on French horse (8) 9 Sweetheart not originally going to firm's dance (8) 10 Imply friend's endlessly drunk (5) 11 Drop of liquid rotund bearing's not good (4) 12 Writers drop marks (10) 13 Leaves on back of agile replacement (7) 14 Retreating into capital city look for missile (7) 15 Crown princess made off (6) 16 Insult by leaving lit (6) 17 18 19 20 21 22

INTERNATIONAL CAPITAL MARKETS

Treasuries rise on producer prices data

By Lisa Bransten in New York and Samer Iskandar in London
Signs that inflationary pressures remain subdued helped US Treasury prices recover some of the ground yesterday that they had lost in the previous two sessions.

monetary policy, that have rolled the market recently. The Labour Department said the Producer Price Index fell 0.1 per cent in May, compared with the median forecast of a 0.4 per cent increase.

Life's September BTP future settled at 115.45, up 0.22. The contract, which had started the day at 115.10, fell rapidly to 114.44 as traders misinterpreted the new government's tax reform plans.

French bonds traded in line with bunds. Matif's June national future settled at 123.16, up 0.10. In the cash market, the 10-year benchmark OAT gained 0.11 to 105.26, yielding 3 basis points less than the equivalent bund, unchanged from Monday.

Slovenia in Yugoslavian debt-swap bond issue
By Kevin Done, East Europe Correspondent
Slovenia yesterday issued new bonds totalling \$812.5m in exchange for its share of the commercial bank debt of former Yugoslavia.

Hellenic Republic to benefit from reduced margins

By Antonia Sharpe
The Hellenic Republic is poised to make its annual appearance in the syndicated loans market with a \$500m five-year loan. The reduction in interest margins over the last year, particularly for emerging-market credits, should work in the borrower's favour.

SYNDICATED LOANS
offered rate, compared with 80 basis points on last year's facility. Including the all-in cost should be slightly over 60 basis points.

of 17% basis points and a commitment fee of 84 points. There is also a \$75m seven-year revolving credit for investor, the main holding company for Sweden's Wallenberg family.

Resounding success for Italy's global FRNs

By Conner Middelmann
Italy's \$2bn issue of global floating-rate notes yesterday was a resounding success, benefiting from the dearth of liquid sovereign FRNs and defensive investors' desire to avoid fixed-rate paper.

Such was the demand that dealers talked of a possible increase, but joint leads Lehman Brothers and Merrill Lynch said that since the deal was to refinance a previous \$2bn FRN, it would not be increased.

NEW INTERNATIONAL BOND ISSUES

Table with columns: Issuer, Amount, Coupon, Price, Maturity, Yield, Spread, Book-runner. Includes entries for US Dollars, Italian Lire, Canadian Dollars, Australian Dollars, New Zealand Dollars, and Euro.

Several smaller dollar deals also emerged yesterday. Germany's Deutsche Bank issued \$200m of four-year bonds, for which lead manager Daiwa Europe reported good demand from Benelux accounts, while Electricite de France issued \$200m of 2 1/2-year notes through BNP and CS First Boston.

December 1996, it was in fact priced at a yield discount to the curve. However, the 6% per cent coupon - the highest level among recent triple A issues - made the paper particularly attractive to retail investors, BNP said.

Of the \$1.5bn facility, \$500m is repayable after three years, since Scottish Power's existing \$800m loan matures in the fourth year of the new facility. The balance is repayable at the end of the fifth year.

WORLD BOND PRICES

Table with columns: Country, Coupon, Price, Yield, Week, Month. Includes Australia, Austria, Belgium, Canada, Denmark, France, Germany, Greece, Italy, Japan, Netherlands, Portugal, Spain, Sweden, UK Gilts, US Treasury.

Table with columns: Strike, Price, Call, Put, Est. vol, Open int. Includes sections for Italy, Spain, and UK.

Table with columns: Index, Price, Yield, High, Low, Est. vol, Open int. Includes sections for FT-Actuaries Fixed Interest Indices and FT-FIXED INTEREST INDICES.

Table with columns: Index, Price, Yield, High, Low, Est. vol, Open int. Includes sections for FT-Actuaries Fixed Interest Indices and FT-FIXED INTEREST INDICES.

US INTEREST RATES

Table with columns: Rate, Bid, Offer, Yield. Includes Treasury Bills and Bond Yields.

Table with columns: Index, Price, Yield, High, Low, Est. vol, Open int. Includes sections for FT-Actuaries Fixed Interest Indices and FT-FIXED INTEREST INDICES.

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BOND FUTURES AND OPTIONS

Table with columns: Strike, Price, Call, Put, Est. vol, Open int. Includes sections for France, Germany, and UK Gilts Prices.

Table with columns: Index, Price, Yield, High, Low, Est. vol, Open int. Includes sections for FT-Actuaries Fixed Interest Indices and FT-FIXED INTEREST INDICES.

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Table with columns: Index, Price, Yield, High, Low, Est. vol, Open int. Includes sections for FT-Actuaries Fixed Interest Indices and FT-FIXED INTEREST INDICES.

UK GILTS PRICES

Table with columns: Index, Price, Yield, High, Low, Est. vol, Open int. Includes sections for FT-Actuaries Fixed Interest Indices and FT-FIXED INTEREST INDICES.

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Other Fixed Interest

Table with columns: Index, Price, Yield, High, Low, Est. vol, Open int. Includes sections for FT-Actuaries Fixed Interest Indices and FT-FIXED INTEREST INDICES.

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CURRENCIES AND MONEY

MARKETS REPORT

US dollar rises on Japanese bond announcement

By Graham Bowley

The yen came under downward pressure on the foreign exchange market yesterday after the Japanese Ministry of Finance announced it was to purchase bonds outright for the first time in three years.

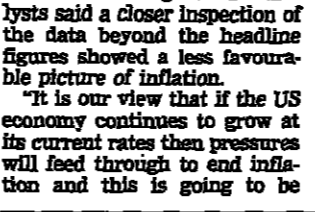
The dollar rose to a 28-month high against the yen after better-than-expected US producer price figures showed inflationary pressures in industry were subdued in May.

The Japanese Ministry of Finance's announcement that the Trust Fund Bureau would be purchasing Japanese bonds for the first time in three years gave the dollar a boost in otherwise quiet trading ahead of a spate of more US data this week.

Traders said market conditions were thin with investors reluctant to take large positions ahead of today's consumer price figures and retail sales and industrial production statistics later in the week.

Mr Chris Turner, currency analyst at BZW in London, said he doubted whether any move by the dollar above ¥110 would be sustainable since pressure for higher Japanese interest rates would soon begin to emerge again.

German and Japanese economies were now recovering strongly. "We began the year with the perception that US German and Japanese interest rates were going lower, but now we are leaving the year with rates moving higher and that is less helpful for the dollar and for high yielding currencies in general," he said.



Mr Avinash Persaud, currency analyst at BZW in London, said he doubted whether any move by the dollar above ¥110 would be sustainable since pressure for higher Japanese interest rates would soon begin to emerge again.

Mr Persaud said the three conditions for a currency's entry into the ERM - political, economic and currency stability - argued in favour of Italy joining the ERM sooner rather than later.

Table showing Pound Spot Forward Against the Pound with columns for Jan 11, Closing mid-point, Change on day, Bid/offer spread, Day's Mid, One month, Three months, One year, and Bank of England index.

Table showing Dollar Spot Forward Against the Dollar with columns for Jan 11, Closing mid-point, Change on day, Bid/offer spread, Day's Mid, One month, Three months, One year, and J.P. Morgan index.

Table showing Euro Currency Interest Rates with columns for Jan 11, Short, Three months, Six months, One year, and One year plus.

Table showing Cross Rates and Derivatives with columns for Country, Bid, Ask, and other market data.

Table showing Exchange Cross Rates with columns for Currency, Bid, Ask, and other market data.

Table showing UK Interest Rates with columns for Instrument, Rate, and other market data.

Table showing London Money Rates with columns for Instrument, Rate, and other market data.

Table showing EMS European Currency Unit Rates with columns for Country, Rate, and other market data.

Table showing Euro Area Money Rates with columns for Instrument, Rate, and other market data.

Table showing Base Lending Rates with columns for Institution, Rate, and other market data.

Table showing Euro Area Money Rates with columns for Instrument, Rate, and other market data.

Table showing Euro Area Money Rates with columns for Instrument, Rate, and other market data.

WORLD INTEREST RATES

Table showing Money Rates with columns for Country, Instrument, Rate, and other market data.

Table showing Euro Currency Interest Rates with columns for Country, Instrument, Rate, and other market data.

Table showing Euro Currency Interest Rates with columns for Country, Instrument, Rate, and other market data.

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Table showing Euro Currency Interest Rates with columns for Country, Instrument, Rate, and other market data.

Table showing Euro Area Money Rates with columns for Instrument, Rate, and other market data.

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Table showing Euro Area Money Rates with columns for Instrument, Rate, and other market data.

Advertisement for Kappel Corporation Limited, featuring a logo and text about bond conversion.

Advertisement for Domus Mortgage Finance, offering a 1% mortgage rate and floating rate notes.

Advertisement for Kappel Corporation Limited, featuring a logo and text about bond conversion.

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Table of fund prices and performance metrics, including columns for fund name, price, and change.

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OTHER OFFSHORE FUNDS

OFFSHORE INSURANCES

Table of offshore insurance products and their details.

MANAGED FUNDS NOTES: Detailed notes regarding fund management, including information on fees, risks, and regulatory compliance.

Handwritten signature or stamp at the bottom center of the page.

WORLD STOCK MARKETS

Table of world stock markets including sections for EUROPE (Austria, Greece, Italy, Germany, Denmark, Finland, France, Netherlands, Spain, Sweden, Switzerland, Turkey, Poland, Portugal), ASIAN (Japan), PACIFIC (New Zealand), SOUTH AFRICA, and AFRICA. Each section lists various stocks with their prices and changes.

Advertisement for PEREGRINE Global Distribution. Text: 'Asian Focus. Global Distribution. Peregrine has the world's largest team dedicated to the international distribution of Asian securities.' Includes PEREGRINE logo.

Table of world stock markets continuing from the previous section, including sections for SOUTH AFRICA, AFRICA, SOUTH AFRICA (continued), and AFRICA (continued). Lists various stocks and their market performance.

INDICES

Table of stock indices including Argentina, Australia, Canada, Chile, Hong Kong, India, Indonesia, Japan, Korea, Malaysia, Mexico, New Zealand, Norway, Philippines, Portugal, Singapore, South Africa, South Korea, Taiwan, Thailand, Turkey, UK, USA, and World. Columns show index values for June 7, 10, and 11.

US INDICES

Table of US stock indices including Dow Jones, S & P 500, NASDAQ, and NYSE. Columns show index values for June 7, 10, and 11.

US INDICES (continued)

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Vertical text on the left margin: 'Intel launch software', 'Airbus stocks', 'big break', 'W'.

Vertical text on the right margin: '97', 'A', 'B', 'C', 'D', 'E', 'F', 'G', 'H', 'I', 'J', 'K', 'L', 'M', 'N', 'O', 'P', 'Q', 'R', 'S', 'T', 'U', 'V', 'W', 'X', 'Y', 'Z'.

NEW YORK STOCK EXCHANGE PRICES

Main table of stock prices with columns for stock symbols, prices, and changes. Includes sub-sections for 'Race to Market' and 'Continued on next page'.

Race to Market. If the business decisions are yours, the computer system should be ours. http://www.hp.com/go/computing. HEWLETT PACKARD logo.

Continued on next page

4 pm close June 11

NYSE PRICES

Table of NYSE stock prices including columns for stock name, price, change, and volume. Includes sub-sections for 'Continued from previous page', 'T', 'U', and 'X-Y-Z'.

NASDAQ NATIONAL MARKET

4 pm close June 11

Table of NASDAQ National Market stock prices including columns for stock name, price, change, and volume. Includes sub-sections for 'Continued from previous page', 'T', 'U', and 'X-Y-Z'.

AMEX PRICES

4 pm close June 11

Table of AMEX stock prices including columns for stock name, price, change, and volume.

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Continuation of stock price tables from the previous page, including various market indices and individual stock listings.

AMERICA

Dow moves ahead as rate fears subside

Wall Street

Rising bond prices and easing fears that the Federal Reserve would raise interest rates by next month helped to lift the US equity market in mid-session trading yesterday, writes Lisa Brantzen in New York.

At 1 pm, the Dow Jones Industrial Average was 27.71 higher at 6,755.58 and the Standard & Poor's 500 had risen 3.56 to 675.72.

The absence of producer price inflation led to an easing of fears that the Fed would raise interest rates by next month in order to combat inflationary pressures.

Technology shares rebounded from Monday's losses, helping the Nasdaq composite, which has about a 40 per cent technology issues content, to move up 6.17 to 1,236.21.

Caracas sinks 1.6%

Caracas returned from a long holiday weekend with the market again prey to profit-taking, which left the IBC index 66.56 or 1.6 per cent down at 4,221.31 by mid-session.

S Africa awaits framework

Johannesburg was weak in tense trade ahead of today's presentation to the cabinet of the cabinet's macroeconomic framework for growth and development by Mr Trevor Manuel, the finance minister.

EUROPE

Cyclicals lively as Frankfurt nears all-time high

Weaker than expected US producer price data made a difference to the European afternoon, lifting US treasuries, the Dow and, eventually, Continental equities. FRANKFURT's Dax index closed a mere 1.58 short of its all-time high at an IHS-indicated 2,571.10.

Cyclicals were livelier, and Commerzbank helped, raising its earnings per share estimates for Volkswagen from DM30 to DM35 for the current year, and from DM40 to DM45 for 1997.

ASIA PACIFIC

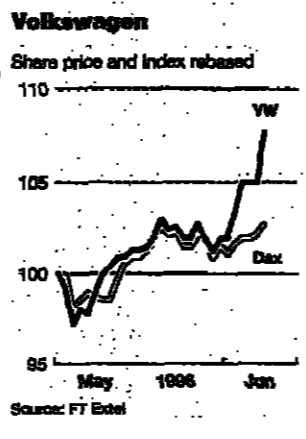
Changes to index spur activity in Taiwan and Seoul

News that Morgan Stanley Capital International is to add Taiwan and raise the weighting of Seoul in its benchmark Emerging Markets Free index from September 2 made for lively, if sometimes uncertain, trade in both centres.

TAIPEI saw sharp early gains partially eroded by profit-taking but the weighted index still closed 52.70 higher at 6,126.79, after a 6,231.98 peak, in active turnover of T\$90.7bn.

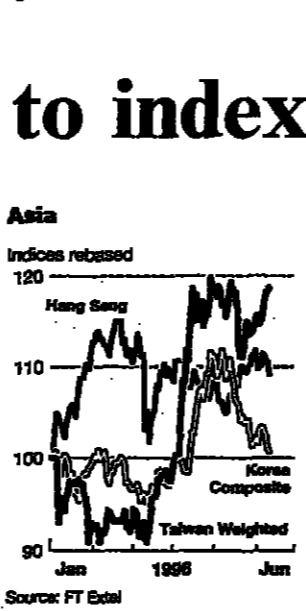
SEUL relinquished early gains on uncertainty over the effect of the Morgan Stanley move, and the composite index turned back from a high of 898.58 to finish a net 3.51 weaker at 898.66.

The Nikkei average gained ground for the first time in four trading days after Mr Ryutaro Hashimoto, the prime minister, defended the current low interest rate policy, writes Etsuko Terazono in Tokyo.



Source: FT Estimate

changed, with the day's US data prompting a pick-up in activity during the afternoon. The SMI index finished 0.2 softer at 3,575.8.



Source: FT Estimate

other businesses by June 24. Its subsidiary Forst, which is quoted in Zurich but operates in Germany, Hungary, the Czech Republic and Slovakia, fell SF30 to SF100.

Moving in the opposite direction, SMH appreciated after SF35 to SF45 in further positive response to last Friday's news conference.

which buy gifts and commemorative items from department stores, indicated that Takashimaya could be banned from participating in their tenders, and investors feared that the revelation could affect corporate demand during the summer gift giving season.

Technical buying supported banks. Sumitomo Bank moved forward Y30 to Y2,080 and Bank of Tokyo-Mitsubishi gained Y30 to Y2,540.

Foreign brokers purchased telecom issues. Nippon Telegraph and Telephone rose Y17,000 to Y95,000 and DDI climbed Y22,000 to Y99,000.

FT-SE Actuarial Share Indices

Table with columns for Date, FT-SE Actuaries 100, FT-SE Actuaries 200, and weekly changes.

ing. Promodes, which peaked at FF11,495 on April 30, recovered FF798, or 3 per cent, to FF71,363.

MADRID ran Telefonica up again, with a gain of Ptas55 at Ptas455 in 5.5m shares dealt; and Repsol joined in, up Ptas105 to Ptas4,415 in nearly 1.6m as the general index posted yet another historic high, 3.74 better at 570.00.

MILAN was uneasy after comments by the finance minister that urgent reform was needed on capital gains and that the government would seek to tax returns on instruments such as derivatives.

Activity related to the MSCI changes spilled over other regional markets on expectations that their weightings would be reduced.

HONG KONG also had more immediate worries about the outlook for interest rates after the sharp increase in key US bond yields, and the Hang Seng index closed 145.69 or 1.3 per cent lower at 10,933.55, but

ist today. Meanwhile, the engineering group VA Technology continued its recent slide on the prospect of legal proceedings against one of its subsidiaries, ending Sch23 down at Sch1,534.

uncertainty over the scale of the proposed reforms. Against the trend, Enl, the energy giant, picked up L47 to L7,366, but among other blue chips, Fiat dropped L77 to L5,127 and Pirelli gave up L36 to L2,533.

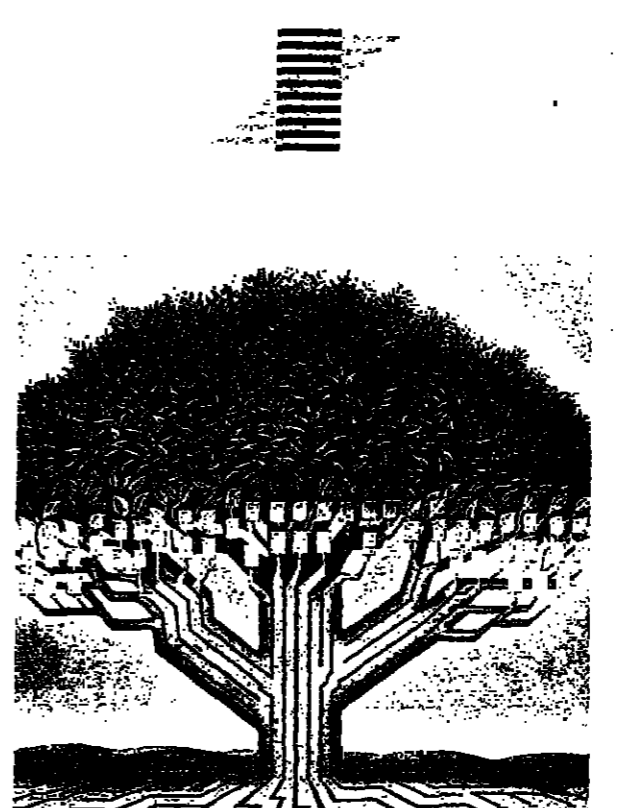
AMSTERDAM, which had been weak, closed flat with the AEX index just 0.12 lower at 570.19. Royal Dutch extended its run, rising F12.40 to a new closing high of F126.50; and Egris, which picked up F110 to F117,650, on a positive recommendation for the two drugs makers from ING Bankers.

VIENNA was underpinned in the last half-hour of trade by news that Mr Johannes Ditz, the economic minister, was on the verge of resignation. The ATX closed 11.06 down at a session low of 1,118.06.

elsewhere, speculation that the central bank governor Vjislav Suptic might be replaced unsettled BANGKOK, which tumbled 1.9 per cent.

FT/SE Actuarial World Indices table with columns for Country, Index Name, Index Value, Change, and other metrics.

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Through

Britain THE ROGUE PIECE IN EUROPE'S JIGSAW

POLITICS

Philip Stephens

FOREIGN POLICY

Edward Mortimer

INDUSTRY

Sir Geoffrey Owen

RELATIONS WITH EUROPE

Lionel Barber

ECONOMY

Sir Samuel Brittan
Martin Wolf

Confrontation with its European partners over beef has exposed once again the nation's deep uncertainties. In this special report, introduced below by Joe Rogaly, FT writers look at the strengths and weaknesses of Britain's restless society and its efforts to leave behind its past and to find a comfortable place in Europe and the world

The Thatcher shock of the 1980s is still reverberating in 1996 Britain. It may ripple through the European social compact out of the system, gradually Americanising the economy. In spite of memories of the mother of Euro-scepticism, the country's membership of the European Union should be secure, but it is under increasing strain. John Major's withdrawal of co-operation from the European Union is but the latest manifestation of this tension. The ban on sales of British beef, following the outbreak of mad cow disease, has aroused John Bull's inherent nationalism. The British prime minister has become the captive of his party's Eurosceptics, yet remains determined to maintain the country's position "at the heart of" the EU. His ambivalence both reflects the public mood and influences it. The electorate appears to be irritated at aspects of membership of the union. The reasons for this dangerous disenchantment are familiar, and stretch beyond the immediate quarrel over beef. Some sceptics recoil from the Maastricht Treaty, which they regard as the blueprint for a United States of Europe. Fear of a single currency has been exacerbated by the unhappy experience of devaluation from the exchange rate mechanism in 1992. A coterie of deeply sceptical editors has emerged to head the ostensibly loyal Conservative press. The irony is inescapable: the owners of some of the most virulently nationalist journals are themselves foreign-born. These are recent eruptions. In a different world, they might subside in time, leaving little trace. There is, however, an underlying scepticism in the national psyche. Britain is the odd piece in the European jigsaw. It is the one with the frustrating shape. Turn it about how you may, it does not quite fit. The United Kingdom, which includes Northern Ireland, is a country apart, an archipelago off the north-western shore of the European continent. In spite of the tunnel linking it with the mainland, it is separated from the European Union by Atlantic waters. Its dominant people, its Anglo-Saxons, are unique. England's history, culture, world outlook, sense of national identity, political structure, and habits of thought are famously different. The UK has not been invaded since the 11th century. Its armies are accustomed to

victory. It experienced nothing like the French revolution or the Napoleonic incursions; it has since recoiled from the rationalism of continental intellectuals. For a while, after 1839, it stood alone. The first modern industrial state, the proud former possessor of a global empire, the beneficiary of a universally-used language, cannot easily subsume itself into a new pan-European entity. Britain retains elements of its glorious past. It is a nuclear power, a member of the Security Council of the United Nations, an habitual contributor of its own military personnel to ventures such as the Gulf war and the UN peacekeeping mission in former Yugoslavia. It is a significant contributor of aid to poor countries, although its generosity is in decline. It is therefore natural for some members of the British elite to contemplate a global rather than a regional existence in the next century. Along with this continuation of the imperial dream there is an equally understandable predilection to maintain the institutions of the past. Some find it strange that the British remain so attached to the Royal Family, hereditary peers, a centralised state, an unwritten constitution, and the other peculiarities of the island polity. The pursuit of the ideal of greatness goes a long way towards explaining these curiosities. The impending arrival of a new millennium in which it may no longer be sustainable is disturbing. The British do not want to let go of their past, particularly while the future is so uncertain. Yet there is a sense of change in the island air, a promise of renewal after 17 years of Conservative administration. The old country has wonders to perform, it knows not what. Many anticipate a Labour government. It could be in place within months, a year at most. Few have an inkling of what it proposes to do. Those who hope it might be more fundamentally "European" may be disappointed. Even fewer have given much thought to what the Tories would do if, to everyone's surprise, they were returned for a fifth term. After nearly two decades of political, social and economic upheaval, with no respite in sight, the country is living on

the edge of uncertainty. It would be unrecognisable to a Rip van Winkle who fell asleep in 1979, when the Iron Lady became prime minister. What would be particularly startling would be the altered landscape of the mind. Capitalism is riding high. The democratic socialism infused after 1945 is a fading memory. Social policies once written off as fantasies of the "new right" have become part of the prevailing orthodoxy. This reshaped consensus looks set to last for the rest of the present decade and perhaps more than one decade after that. Tony Blair, the Labour leader, says his party would build on Thatcherism. Its

words in opposition have been true to that undertaking. A ministerial salami-slicer steadily trims away at the welfare state: the formerly left-of-centre Labour party underbids it. The gap between rich and poor grows wider; Labour's traditional strategy of using the tax system to redistribute income has been replaced by talk of increasing opportunity. The trade unions are in abeyance; Labour acquiesces. The assumption that the government can solve everything has been abandoned.

As ideology has converged, the trustworthiness of politicians has been challenged. British public servants are probably less corrupt than their counterparts in some other countries, but the revelation of the private earnings of members of parliament, and secret decisions made over arms sales, has revealed "sleaze" in high places. The consequence is a deep contempt for politicians and a growing disenchantment with the formal political process. New political parties have sprung up. Miners' leader Arthur Scargill has founded a "Socialist Labour" party. Sir James Goldsmith is promoting a faction aimed at forcing a referendum on Europe. Environmentalists and the animal rights

movement have taken direct action, with dramatic consequences. Shock therapy such as Britain is experiencing may be unsettling, but it can be beneficial. Industry is leaner and in some ways fitter. The economy is stronger. Inflation is under control, more or less, in spite of an anticipated return to a more rapid rate of growth. Macro-economic management has achieved a remarkably harmonious balance, although government borrowing is not yet under control. The labour market is the most flexible in Europe. Social charges on employers are the lowest. In a country that seemed ungovernable in the 1970s, management manages. Trade union membership peaked at 13.3m in 1979 and has fallen steadily since, to scarcely above 8m today. In consequence, direct investment is pouring in from other countries, more than in any neighbouring EU country. Foreign-owned companies now account for about 15 per cent of the jobs in the United Kingdom. This share looks set to grow. British industry has been modernised, partly in consequence of the Thatcher reforms, and partly in response to the pressures of world markets. It has become more specialised, more international and carved itself a niche that should suit a medium-sized industrial nation. Output has not increased, but productivity has. At the same time the little things of life are changing, mostly for the better. There are more personal computers per head than in any other European country. British Airways functions effectively. British Telecom offers a quality of service that was unimaginable in the days when all telephones were black. More questionably British Rail, one of the few remaining state-owned businesses, is being privatised. All unthinkable two decades ago. As the price of such rapid advance is a concomitant increase in stress among individuals and families. The polarisation of the upper and lower income groups is more stark than ever. An annual survey of Britain's richest 500 individuals finds 10 billionaires to fill the top notches in the league table. The national lottery is creating new millionaires throughout the year. Some of the wealthy live like Californians minus the sunshine. In contrast to the 1970s there is no pressure upon them to hide their good fortune. At the bottom end, the poorest live in some of the most depressing slums in Europe. Government ministers dispute the existence of the truly poor: there are, they indicate, merely periods of life when some people are hard up. The Labour leader speaks less often of the disadvantaged than of the middle classes. These attitudes are symptomatic of the hard-nosed philosophy that characterises the 1990s. As in other countries, the middle classes, professionals, white-collar workers live in fear of "downsizing", the propensity to trim the fat from companies and government departments alike. In consequence, the British people are in tremulous mood, uncertain about job security, frustrated over the value of houses bought in the booming late-1980s, fearful of crime. There is a search for someone to blame. The obvious scapegoat is the foreigner, expressed as the EU. The Thatcher tidal wave has yet to work itself out.



and Seoul

Society • By Andrew Adams

Through a class system darkly

Statistics reveal a somewhat ambiguous picture of the divisions in British society

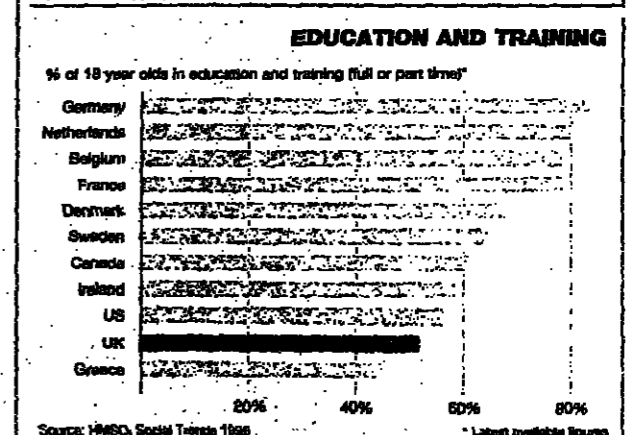
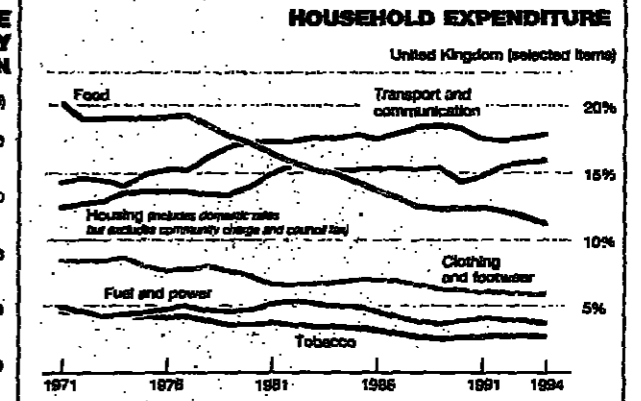
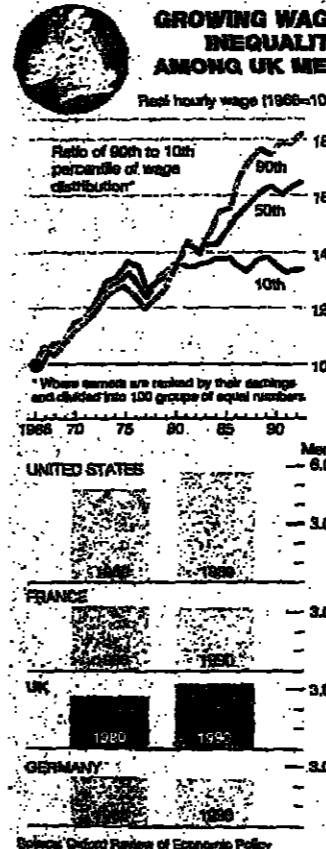
To understand modern British society you have to confront England's extraordinarily resilient and emotive class system. Two recent controversies graphically illustrate this truth: the first to do with the definition of "middle class"; the second concerning the persistence of poverty. In mid-April Mr John Prescott, a bluntly spoken former trade union shop steward and now deputy leader of the Labour party, announced on morning radio that he was middle class. "My roots, my background and the way I act are working class, but it would be hypocritical to say I'm anything else than middle class now," he declared, denying all claims to still being "a working class warrior". As a statement of fact, for an MP earning £34,000 a year, this was hardly news. Nor was the sub-text particularly opaque, given the single-minded focus of the main political parties on the voting votes of middle-class middle England. The prime minister, Mr John Major, long ago declared his goal to be the creation of a "classless society" by the year 2000. Having elected, in Mr Tony Blair, public school and Oxbridge educated barrister as its leader, Labour wants to present his shadow cabinet team as a chip off the same

block. However, Mr Prescott's remarks caused a media storm. They became a story in their own right (particularly after the politician's mother said "the working class at heart and always will be"); and they produced a spurge by commentators on the nature and persistence of class in England. Scotland, it seemed to be agreed, was less class-ridden. "The class war survives in Britain as bitter skirmish, ludicrous posture and constitutional feud," declared one senior columnist, inevitably introducing the recent marital wrangles within the royal family. A sociology professor quipped that class continued to matter in Britain because social mobility was less than in countries such as Australia and the US. This echoed an outspoken article by the government's chief inspector of schools, shortly before the Prescott furore, arguing that failure among "white working-class boys" was endemic in England's education system and a cause of deep concern. School league tables, ranking local authorities by exam performance and published since 1982 by ministerial order, show a close correlation between social deprivation and exam performance. In many inner city authorities, only tiny proportions of pupils gain suffi-

cient grades to proceed to higher education. The poverty controversy was equally revealing. Welfare campaigners picked up on a letter from Mr Peter Lilley, the social security secretary, justifying the government's refusal to introduce a national poverty eradication plan as agreed by countries, including the UK, at last year's United Nations summit on social development in Copenhagen. "We already have the infrastructure and social protection systems to prevent poverty and maintain living standards," Mr Lilley claimed. This remark caused another storm. It came as the Child Poverty Action Group, a pressure group, published figures claiming that poverty increased sharply in the 1980s, and faster than in the rest of Europe. Britain has no official measure of poverty, but the

report took two commonly used yardsticks: the number living on or below the level of income support benefit, and the number on income below half average wages. By 1992, 24 per cent of the population was on or below the level of income support (then £42.45 for a single person over 25 or £105 for a couple with two children under 11), while in income growth has, proportionately, fallen well behind that of the middling and higher groups, analysis of their expenditure shows a different story. Defining "relative poverty" is also highly problematic. The annual studies of social trends show a dramatic growth in most household accessories. Access to a freezer, for instance, grew from 32 per cent of households in 1979 to 82 per cent in 1993; to a telephone from 47 per cent to 74; and to central heating from 43 per cent to 76. Nonetheless, neither the dramatic growth in extremes of wealth and relative poverty that has taken place since the early 1960s, nor the problem of endemic unemployment, nor the figures showing huge increases in single parenthood - now, alongside unemployment, the prime cause of low income - can be denied.

Debatable statistics. All of the above factors, however, exhibit the continuing relevance of class segmentation in Britain and its limits as an explanatory framework. The rise of single parenthood, for instance, cannot be understood apart from the weakening of marriage as a social institution, which is a cross-class phenomenon. Fears for the fate of marriage are underlined by legislation about to be enacted making "no fault" divorce the norm and generally available within a year of first request. But again the statistics are debatable. Figures for 1993



Classless society: Tony Blair, leader of the Labour party, wants to present his shadow cabinet team as free of class considerations

ERVICES

4 BRITAIN: Industrial change

A view from Brussels • By Lionel Barber

A risky policy of divide and misrule

An ambivalent attitude towards European union looks increasingly dangerous

The British often describe their role in Europe as that of a useful troublemaker, knocking sense into misguided foreigners and avoiding unnecessary entanglements.

Sir Roy Denman, who served as the EU's ambassador in Washington, argues in a newly published book that a wavering Britain risks becoming marginalised, a fitting end to the "tragedy of Britain and Europe" in the 20th century.



Sir Roy Denman. The thirrus test for British policy towards Europe remains monetary union

The Denman thesis is exaggerated, notably in its claim that the EU, a diverse, often fragmented entity, is close to superpower status; but it reflects a widely held view in Europe that monetary union and enlargement will happen.

whelmingly as an asset. Despite grumbles about contaminated British beef or Tory Euro-scepticism, the British ability to inject practical sense into a debate, particularly on foreign policy, is admired.

Much of the present trouble between Britain and Europe is due to the Conservative party's waffling majority rather than to an endemic national character flaw. "The problem is not John Major," says a senior Belgian diplomat. "The problem is that he has a weak government."

This is true of Germany, where the chancellor, Mr Helmut Kohl, is intent on binding his country irreversibly into a network of integration extending west of the Rhine and east of the Vistula; but it also applies to the European Commission, the Benelux countries, even perhaps to the Scandinavians when it comes to the environment, social policy, and justice affairs.

Independent actor outside it. Thus France has signed up to the German-led majority view that an *avant garde* principle allowing some countries to move ahead in integration may be inevitable.

The EU is considering formulae for joint action that bypass the national veto such as a "very strong majority" (12 out of 15 states) or consensus minus one. Countries "opting out" would not, however, receive a free ride. At best, they would be required to pay for joint actions; at worst, they could find themselves shut out of Council discussions.

To an extent, plans for new flexibility anticipate arrangements needed to manage a Union of 20-plus members that will include economically weaker countries from central and eastern Europe. But they also draw inspiration from the British opt-outs on monetary union and social policy won in the Maastricht treaty negotiations.

Manufacturing industry

Transformation in the past 20 years

The complacency of the post-war period has been replaced by a drive for modernisation, writes Geoffrey Owen

Over the past 20 years, British industry has gone through a delayed modernisation. For the first three decades after the second world war, British manufacturers lost ground to overseas companies, which were quicker to exploit the opportunities created by the expansion of world trade.

Towards the end of the 1970s, and more decisively in the 1980s, the tide began to turn. Companies were reorganised as managers set about correcting past mistakes and aligning their strategies to the needs of the world market. Government policies, instead of holding back industrial change as they had done for most of the earlier post-war period, stimulated and facilitated it.

The trick is how to organise such a flexible Union without running the risk of fragmentation. The consensus in the IGC negotiations is that countries will have to subscribe, willy-nilly, to a core set of obligations involving the single market such as the freedom of movement of capital, goods, services and people.

range of steel-using businesses. Like many other long-established British companies, it was almost wholly dependent on Britain and the Commonwealth. The nationalisation of steel in 1967 removed one of the original props of the group, but it was not until the second half of the 1970s, when its financial position deteriorated, that a drastic change of direction became necessary.

What happened in the 1980s and 1990s could not repair all the damage caused by the earlier lag, nor could it restore British industry to the pre-eminent position it had once enjoyed. In adapting to what had become a more crowded market, British companies have had to play to their strengths, concentrating on businesses that could hold their own on the international stage and withdrawing from those that could not in some cases, gaps left by uncompetitive British-owned firms have been filled by foreign companies.

As the vogue for front-wheel drive spread throughout the world's car manufacturers, Birfield's unique technology enabled GKN to build an international business in vehicle components, with Continental Europe and the US as two of its principal markets. It was a painful transition, involving divestments, closures and redundancies, but GKN succeeded in re-inventing itself in a form that was better suited to the market conditions of the 1980s and 1990s.

appointed leaders who were prepared to rethink the unthinkable, questioning the assumptions on which earlier strategies had been based. In Imperial Chemical Industries (ICI), Britain's largest chemical company, the trigger for change was the severe recession of 1980-1981, when the dividend was cut for the first time in the company's history.

Each industry has had to find its own way of integrating itself into the world market. The paper and board industry, once seen as a hopeless case because of Britain's lack of indigenous forest resources, is a perfect example of belated modernisation.

The instigators of reform have been managers who had a more realistic view of their companies' strengths and weaknesses than their predecessors. But the pressure for change was reinforced by Thatcherism. While the reduction in trade union power is rightly seen as one of the most important events of the 1980s, no less significant was the abandon-

ment of the interventionist industrial policies that most earlier British governments had pursued. The Thatcher government refused to support "national champions" or to bail out "lame ducks". Virtually all the industries and companies nationalised since 1945 were returned to the private sector, and it is here that some of the biggest gains in productivity have been achieved; the British Steel Corporation is the most celebrated example.

Some observers deplore what they see as a loss of national sovereignty in key technologies, but the performance of two industries that had earlier been the target of extensive and mostly ill-judged government intervention, electronics and cars, has been greatly improved as a result of inward investment. One may regret the mistakes by managements and governments that led to the decline of British Leyland/Rover in the 1960s and 1970s, but this company has a better chance of surviving in the world market as a subsidiary of BMW of Germany than as a ward of the state.

A once-insular British industry has become part of the world market, with higher productivity, higher exports and more modern equipment. It is a microcosm of what has been happening to British manufacturing as a whole.



That's the way to do it: the catalysts for modernisation were partly linked to the policies of Margaret Thatcher's government

Energy utility industry • By David Lascelles

No end to power struggle

After 10 years of revolutionary change, the energy industry has yet to find stability

Britain's energy utility industry, the pride of its privatisation programme, is in turmoil. The gas and electricity sectors are both undergoing far-reaching restructuring in what many people see as a belated response to mistakes made in the original sell-offs.

The problems of the gas market are the exact opposite. Where electricity may have been privatised in too fragmented a form, British Gas was sold as a monumental monopoly that is now having to be broken up.

On the domestic front, gas prices have gone down 24 per cent since privatisation. Electricity prices are higher, partly because of the imposition of VAT on electricity bills in 1994. But they are heading down again following the introduction of new price controls by Ofwat, the regulator.

But she adds: "It is hard to believe that we'll continue in this regime when there's so much going to the shareholders." The large future demands for capital in the utilities industry will help redress this imbalance, she says.

Telecommunications and information technology • By Alan Cass

Stopping and starting on the superhighway

Although progress has been made, the UK's record in the information technology revolution remains patchy

The mid-1970s, the dawning of the age of the microchip, found Britain with a state-owned, narrowly focused and monopolistic telecommunications operator and a single computer "national champion", ICL. It also had three manufacturers competing in the development of "System X", the flagship telecoms switch destined to become the cornerstone of BT's national network.

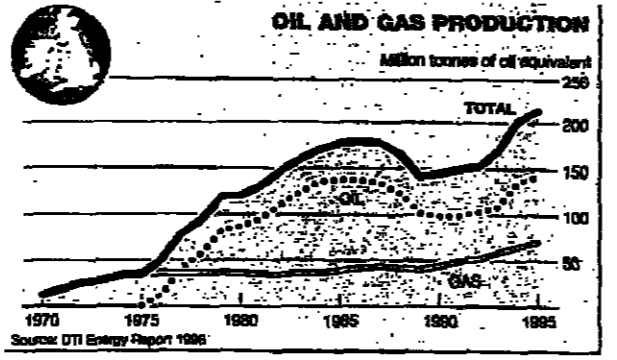
The UK's patchy, often erratic response to the possibilities of the information technology revolution. Talking to the British Computer Society in 1981, the author and consultant Mr David Butler argued: "That Britain Limited should seize the opportunity of the information society and turn it to great economic, social and cultural advantage is not, of course, impossible."

Prices have been forced down by technology, competition and regulation

companies are among the first tier of PC manufacturers, the country is an important manufacturing base for global suppliers such as Compaq and IBM. It is also a favoured site for semiconductor manufacturers, with water and skilled labour in abundance in key areas.

Videologic is pioneering a new kind of alliance it calls the "chips chip company" with NEC, one of Japan's largest semiconductor makers. Videologic designs the chips, NEC manufactures and markets them and the UK company collects a royalty on each chip sold. Apartnet, once a leading UK PC supplier, is now the global server design centre for its new owner, Mitsubishi Electric of Japan.

It remains to be seen what part the UK can play in providing content for the galaxy of new entertainment channels based on digital technology that are promised by the world's broadcasters, the BBC and BSkyB among them.



North Sea fields of dreams

North Sea oil, the largest windfall the UK has ever enjoyed, is proving to be anything but the brief bonanza the sceptics once warned it would be.

Twenty years on, British Telecommunications remains dominant in the UK but has to fight its corner with 150 competitors in what has become one of the world's most liberal markets. Abroad, it aims to be a leading international operator and has secured an equity alliance with MCI of the US to help realise its ambitions.

The UK has become a laboratory where foreign-owned operators develop and refine services that may be forbidden in their home countries. The country's expanding cable communications network, for example, is chiefly owned by US telecoms operators but, until recently, have not been able to offer telephone calls over their cable networks in the US. Total investment in the cable network - an embryonic "information superhighway" - is expected to top £10bn by the turn of the century.

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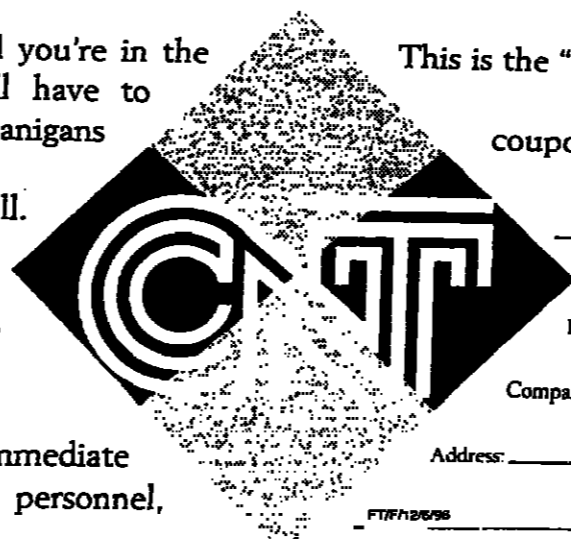
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6 BRITAIN: Investment and infrastructure

Foreign direct investment • By Stefan Wagstyl

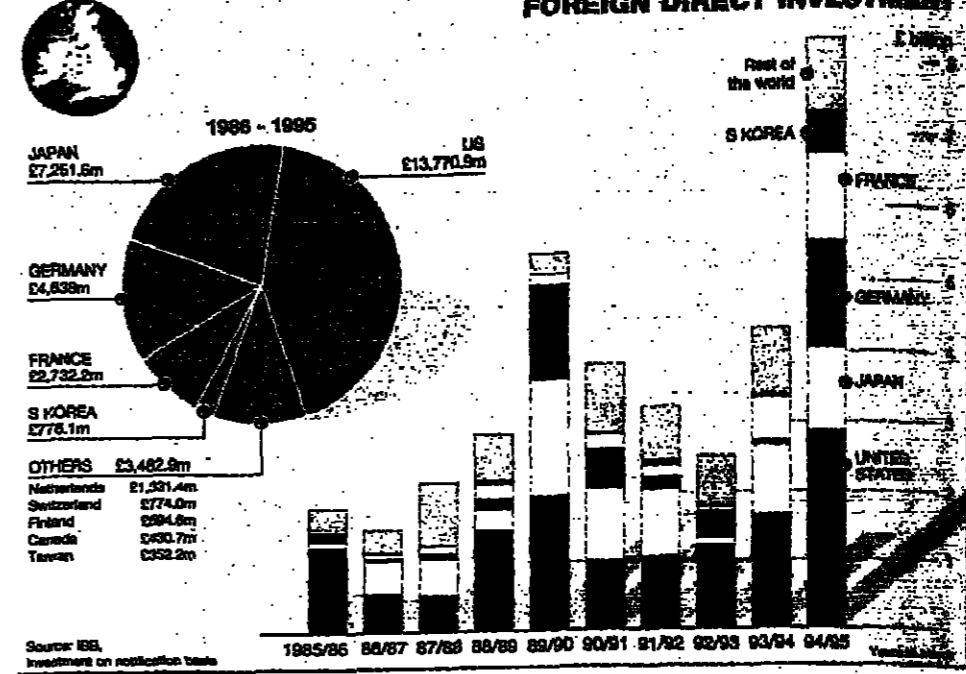
A flood still in full spate

The UK has been the top destination for non-European investors for some 20 years

Acron, a family-owned company making flour-milling equipment in New Jersey, in the US, is just one of the 500 or so companies that have invested in Britain in the past year. Its plant on the Trafford Park Industrial Estate, in Manchester, will employ up to 50 people producing machines for the European market.

has been boosted in the 1990s by capital from South Korea and Taiwan. In what would be the biggest inward investment so far, LG Electronics and LG Semiconductor, members of the LG group, are considering investing £1.5bn in two plants – one for microchips and the other for electronics components.

advantage. But investing companies say that this alone does not explain why Britain gets fully 40 per cent of the American and Japanese investment in the European Union. They point to the flexibility of Britain's labour force and the range of skills available at reasonable cost, combined with good transport and other infrastructure.



The regions of Britain • By Michael Cassell

Inward investors redraw the map

New interest in the old industrial heartlands could reverse the north-south divide

Bravely peddling the promise of strong and sustained economic revival to an unbelieveing public is an accepted part of political life. Given the historic and wide gap in regional performance that forms part of the country's economic make-up, an added refinement in Britain is to guarantee good times for every corner of geography.

Changes in technology mean that jobs in the finance sector will appear as easily in Leeds as in London. Others claim that without more fundamental policy changes the divide will persist and that any apparent narrowing in differences between regional economic performance merely reflects short-term swings in fortune between various types of economic activity.

Science and research • By Clive Cookson

Flow of accolades dries up

British scientists still command global respect, but they are winning fewer prizes

The Nobel Prize announcements used to be an annual ritual of self-congratulation for British science. For four decades after the second world war, the UK won science prizes at an average rate of about one per year, and by 1955 it had built up an outstanding record of Nobel achievement second only to the far larger US.

The UK industrial performance in electronics has been especially disappointing

In contrast to pharmaceuticals, the UK industrial performance in electronics has been especially disappointing. Britain retains excellent centres of academic research in semiconductor physics but they tend now to collaborate with non-UK companies.

The most popular target for criticism is lack of innovation

well-heeled Wiltshire or east Sussex. When skills shortages become a pressing problem for Newcastle industrialists and when the government redraws its grant aid map to include that part of south-east England closest to the continent, the old north-south divide simplifies can no longer apply.

Communications • By Charles Batchelor

Mixed signals delay progress

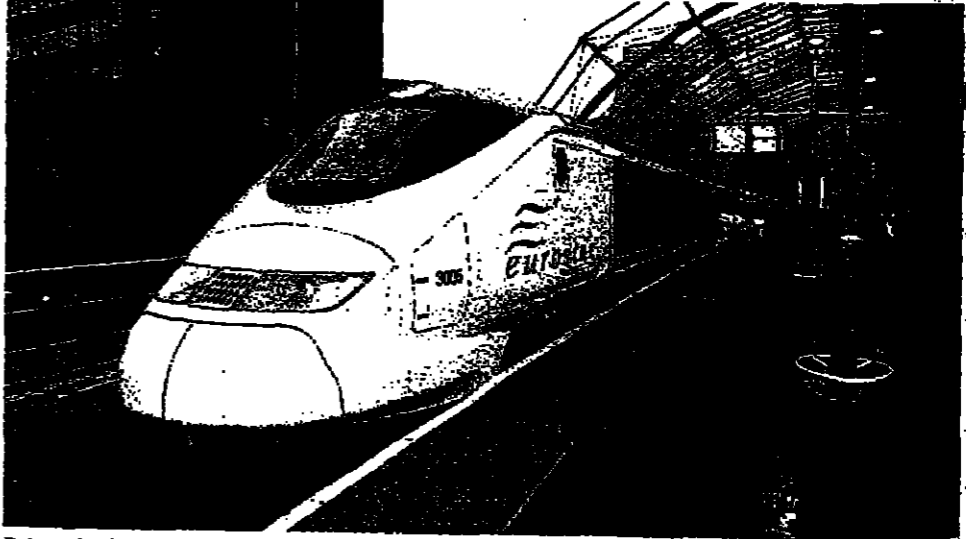
Improvements to communications links require more coherent planning goals. Historical connections and a favourable position in the world's time zones have given Britain a pre-eminent position on the world airline map.

Delay: the Channel tunnel was completed in 1994 but a fast link on the British side of the Channel is not expected until 2003

Being played out in a public inquiry now half-way through its expected two-year term, BAA, the airports group, says that a fifth terminal is needed to increase capacity at the airport from 82m passengers a year to 80m.

port: The Way Forward, published in April

This restated the problems and proposed involving local authorities more closely in transport planning but provided no far-sighted strategy. It also avoided setting targets by which the success of policy could be measured.



Delay: the Channel tunnel was completed in 1994 but a fast link on the British side of the Channel is not expected until 2003

UK CO... The gra... back int... innovatio

UK CONSTRUCTION RESEARCH

The gradual move back into the future

Building is very different from mass production and customers are conservative about new designs, writes Andrew Taylor

Construction is a very conservative industry. Innovation in design, materials and production techniques is pedestrian by comparison with most manufacturing sectors.

The way in which cars look, perform and are produced, for example, has changed dramatically over several decades. The designs and performance of many household consumer goods have altered significantly, too.

The buildings which the consumers inhabit, by comparison, have changed much less. Building materials and construction techniques have been slow to change.

Construction companies and manufacturers have been criticised for failing to invest sufficiently in research to keep pace with the changing demands of a modern world.

Critics say the need to develop new products and techniques is likely to become increasingly important as consumers and governments become more concerned about the need to conserve energy and protect the environment.

Figures reported elsewhere in this survey reveal the low level of industry and government spending on construction research, although efforts are being made to improve this.

The environment department next month is expected to announce that £280m was spent on construction research in 1994. This represents less than half a per cent of the £50bn spent on construction output in Great Britain that year.

Private companies are estimated to have contributed 60 per cent of construction

research spending in 1994, the bulk from materials and components manufacturers.

The environment department figures exclude money spent on problem solving on individual projects. Nonetheless, they provide a good guide to the low level of investment by many companies.

The car industry, by comparison, spends roughly 5-7 per cent of turnover on research. The chemical industry, excluding pharmaceuticals, invests 3-5 per cent.

The reasons for the proportionately lower spending by the construction companies reflect several factors, not least the low profitability of the industry in recent years.

The fragmented nature of construction means that, even in good years, there are few large groups with resources available to fund sizeable research budgets on their own. Few have the incentive to pursue research when they have no overall control over the design and construction of buildings.

Building, also, is very different from mass production. It involves a much higher degree of risk, conducted in the open air and in varying ground conditions. Many customers are conservative and reluctant to accept innovative designs.

One of the biggest changes in the industry over the past decade has been the switch to prefabrication of many components. Steel beams, pre-cast concrete sections, even self-contained lavatory "pods", are manufactured in factory conditions and delivered to site ready to be installed.

There are also some grounds for optimism. Taywood Engineering, part of Taylor Woodrow construction group, and one of the largest private sector construction research operations, says customers are becoming more innovative.

Mr Roger Blundell, director of research at Taywood says: "Customers like BAA, the airports authority, responsible for

a continuous building programme have become much more concerned about quality and full life cost of a building rather than simply opting for the lowest capital bid on each individual project.

"The environment department has launched joint campaigns with the industry to help companies like ours win a greater share of European Community grants, under initiatives like the Esprit Programme. The department is also helping industry forge closer contacts with academic organisations so that limited research budgets can be better focused for commercial ends."

Taywood Engineering receives about £750,000 a year from its parent group to fund research which it is able to use "as a lever" to lift its annual spending to about £2m backed by the EU and other grants. It has spent about £1m on developing IT systems to improve computer-aided design using three dimensional images.

The computer model traces the entire building programme from initial design, through all the component phases, to completion enabling contractors and architects to test solutions before they are attempted on the construction site.

Other research, currently being pursued by the likes of Taywood and consulting engineers Maunsell, includes the development of plastic-based materials to replace steel as a reinforcement in concrete.

One of the most exciting areas of research into so-called Intelligent Buildings has been prompted by the electronics revolution. Sophisticated control systems enable occupiers to determine temperature and lighting in individual rooms taking maximum benefit from natural sunlight, even automatically opening windows.

At the heart of British construction research efforts is the 75-year-old, government-controlled Building Research Establishment (BRE) which is shortly to be privatised. In



St Albans Abbey: a colour meter is used on 14th century wall paintings to test for fading. This will provide a reference for conservation in a BRE project starting next month.

Design: by David Lawson

Blowing both hot and cold

In recent years, the focus has changed from pure research to practical application

The fund manager got up to close a window behind his desk. An unseasonably warm spring afternoon had removed jackets, loosened ties and raised tempers. But traffic noise and dust sweeping into the office made conversation almost impossible. "You can see now why we demand air-conditioning," he said.

This dilemma has returned to haunt the construction industry as it recovers from recession. Buildings are beginning to rise again, and with the bricks and mortar comes the problem of how to balance the

demands of creature comforts, running costs and new environmental standards.

When tower cranes last walked across city centres there was little debate. People like our sweaty fund manager who paid for development demanded maximum comfort for potential tenants. That meant air-conditioning, a notoriously energy-intensive solution. But when building ground to a halt, research continued into alternatives. "One advantage of the recession is that it gave us more time to study what we were designing," says Mr Tim Battle.

He has watched the focus move from pure research into practical application over the last few years with some satisfaction, after his firm, Rybka Battle, played a big part in pushing forward the argu-

ing, developed for the telecommunications company by St John's College, Cambridge, on its nearby business park, has become a totem. This uses existing technology in innovative ways to improve what is now called "staff comfort" rather than simply energy costs.

A good deal of research is also geared to monitoring whether, and how well, these energy-saving ideas work. "It takes hard evidence to fight for changes in the way we construct buildings," according to one of the designers, Mr Tim Battle.

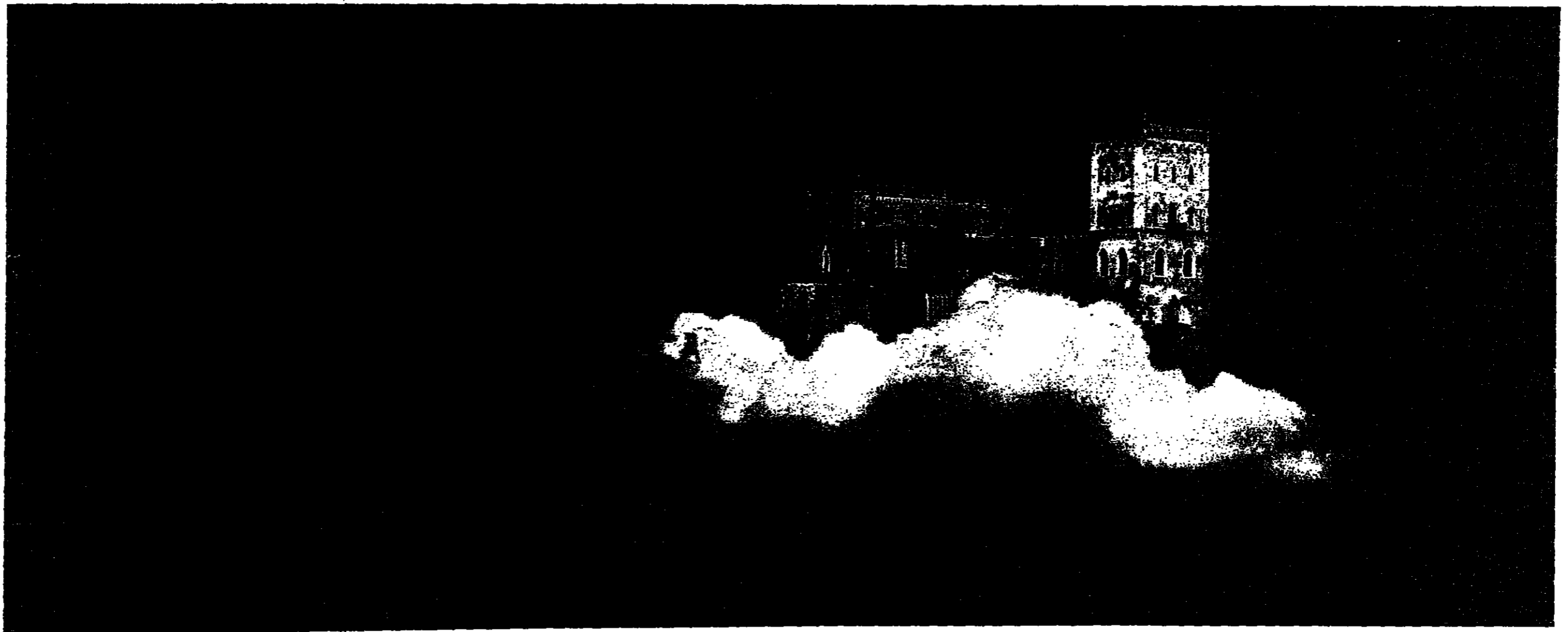
Several landmark schemes have emerged even during this quiet period. The Ionica build-

ings, developed for the telecommunications company by St John's College, Cambridge, on its nearby business park, has become a totem. This uses existing technology in innovative ways to improve what is now called "staff comfort" rather than simply energy costs.

The Building Research Establishment (BRE) has created its own test bed for the industry by constructing a complete office block at its Watford headquarters. The three-storey building is giving researchers chance to work on a live project right on their doorstep, according to BRE project manager Mr Mike Cliff.

It includes innovations such as natural ventilation via computer-controlled opening windows and solar-powered stacks. But a particular advance is the wave-shaped floor slab. This increases the concrete surface area, and thus the thermal

Continued on Page 11



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consistent success is embarrassing.

'OK', we hear you say, 'So you're successful in creating the right environment for R & D and attracting funding, but give us a few concrete examples of where this innovation has worked'.

Well funnily enough, the first three are in concrete technology. Number one is the Harding Gravity Base Tank in the North Sea for BP. A fine example of an ingenious solution leading to a real benefit. An innovative design combined with lightweight concrete, gaining a forty per cent reduction in cost over BP's original design (Concrete floating on water. Impossible? Well you'd have thought so).

Number two is in Kuala Lumpur, where because of our comprehensive packaging of technical and financial engineering, we have initiated and developed the first successful fully privatised Light Rail Transit System. Here the

technical innovation was to use pre-cast concrete cantilevers for the railway viaducts, that could be placed in position using an overhead gantry, thus overcoming the need for cranes, which would have created unacceptable congestion.

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The Albert Hall is some where else that sings our

praises. Our project modelling convinced them we were the right people to carry out a highly sensitive refit.

Our final example is Cranfield University, where extensive research at design stage lead to a 24% reduction in construction time and meant their Library of the Future opened on time and not some time in the future.

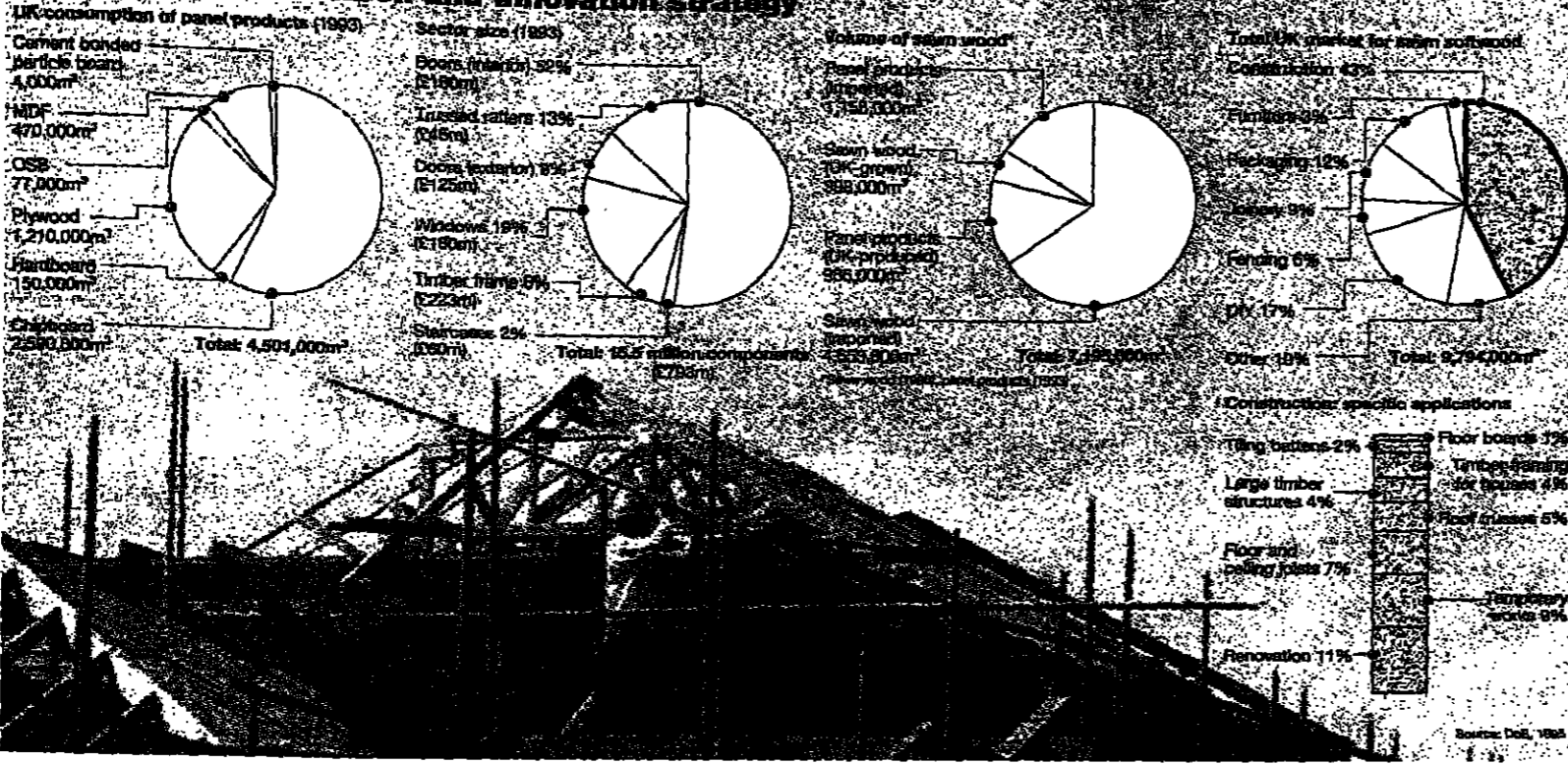
Now, all these successes must make good reading. Especially as one or two border on the impossible.

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Timber 2005: a research and innovation strategy



Site investigation: by Kristina Smith

Precautions against nasty surprises

Technology has had to match the pace of the fast growing market of derelict land

Thirty years ago near Bury St Edmunds town centre, construction of a new housing estate had to stop when gaping holes appeared where several of the gardens had been. No one had bothered to check what was underneath the plot. If they had, they would have found a maze of old chalk mines dating back a hundred years. Things have improved since then - but maybe not enough. Contractors still come across surprises - and rarely are they happy ones.

The Environment Act, when in place, should put paid to such situations. It will cover who is responsible for contaminated land - the contaminator or falling that the owner - and how they should go about dealing with it. So-called "brown field" sites - derelict land which had previously been developed - will become more and more important to developers over the next 10 to 20 years. And people will be forced to discover what nasties are lurking beneath the surface. Because of this fast growing market, ground investigation for contaminated land is where many of the technology advances are happening at the moment. Traditional methods like trial pits (in effect, digging a big hole and looking at what comes out of it) and bore holes

Dr Ron Barker has been working for a number of years on electrical imaging, or tomography, and three years ago the technique reached the commercial stage. Several UK companies now offer the service. Electrical imaging involves measuring the resistivity between two electrodes and gradually increasing their separation. Software can then change the results into two dimensional - or even three dimensional - maps through cross-sections of the ground. These rainbow coloured maps look very pretty, but to the trained eye they can reveal numerous things about the type of ground and what it contains. The technique can be used in many applications: monitoring landfill sites, contamination studies, identifying rock levels in highway studies or monitoring the plastic sheeting which lines new landfill sites to see how it performs over its life. There are other methods developed specifically with the ever-increasing market for brown field surveys in mind which involve physically pushing instruments - rather than waves - into the ground. Fugro specialises in such techniques - one is the Laser Induced Fluorescence Cone (LIF) which the company has only been using for 18 months. LIF is a development of the standard Cone Penetration Testing (CPT). CPT involves pushing a cone with a friction sleeve into the ground and measuring the resistance using strain gauges within the sleeve which are connected to the surface by cables. In the new method there is a little window at the base of the penetrometer. Laser light is sent to the window by fibre optic and the reflected light is brought back. Mr David Youdan, Fugro's divisional head of structural monitoring, explains: "Medium to high density hydrocarbons fluoresce," he says. "The frequency and duration across the spectrum means we can differentiate between - for example - tar, unleaded petrol, leaded petrol, various oils. And the results can be seen there and then on site. But however wonderful these new techniques, they have to be correctly used and the results correctly interpreted. Dr Littlejohn urges clients to put an expert on the job - not a civil or structural engineer, but a geotechnical specialist. Kristina Smith is a reporter with Construction News

New materials: by Martin Spring

Waiting in the wings for recovery

The quest is for smart materials that adapt to changes in the environment

Prospects for a Brave New World of innovative building materials are not particularly bright in Britain at present. One reason is that, with the building industry still in recession, research and development take a low priority. In addition, the pendulum of public opinion has swung back from new to traditional architecture and technology. That said, there is still a gamut of new materials and technologies waiting in the sidelines and ready to be activated if and when building construction picks up again. As its products are invariably large in scale and installed to last for years or decades, the building industry tends to borrow new materials and technologies that have already been tried and tested at less expense and risk in other smaller-scale industries. Most current product innovations are adaptations of existing materials, but a few are exciting new technologies. For the technical wizards of the construction industry, the current holy grail is smart materials. These are materials that react physically and automatically when external conditions change. Mr Steven Groat, head of research and development at structural engineers

Ove Arup & Partners, says: "We will increasingly see the use of inert materials with the behaviour of live, organic materials." The attraction of smart materials is that they enable building elements to adapt automatically to changing environmental conditions. Mr Groat uses the analogy of Gore-tex clothing fabrics that "breathe" by letting water vapour pass through while blocking water liquid. "In fifty years time, external walls will incorporate selective membranes that will be sensitive to fluctuations in temperature and humidity and automatically control natural ventilation," he predicts. "This should be useful in saving energy."

A smart material that is closer at hand is electrochromic glass, which switches from clear to obscure states when electrically activated, much like the liquid crystal display of a pocket calculator. In the stylish new offices of a London advertising agency, partition panels incorporating "Priva-Lite" glass manufactured by Saint-Gobain Glass have been installed that allow the occupants to switch from clear views and daylight to privacy behind an obscure screen at the touch of a button. A few years further off is photochromic glass, which becomes darker or lighter according to the intensity of light falling on it. Photochromic glasses are already used at a price - in spectacles and sun roofs of cars. If incorpo-

rated into cladding panels, they could theoretically control the glare and heat from the sun entering a building. Other smart materials now under experimentation in north America include so-called self-healing concrete. Fibres containing liquid resins are cast within a concrete structure so that, if the structure begins to fail, the fibres split open and the resin seeps out to re-bond the cracking concrete. Even microbes can be smart

steel and it has the added benefit of being self-finishing and nearly maintenance-free. The main drawback is the expense entailed in complex engineering and intricate shapes of the moulds. A handful of lightweight bridges have already been constructed in Britain using fibre-reinforced plastic to designs by the plastics division of the structural engineer, Mammell. The largest to date is a cable-stayed footbridge in Aberfeldy, Scotland, which has a total length of 113m yet weighs only 23 tonnes. Timber, one of the oldest traditional building materials, is rapidly regaining popularity, partly for its attractiveness as a natural material that is warm to the touch, and partly because it can be one of the few renewable, eco-friendly building materials.

The use of plastics or polymers is steadily growing in the industry

and potentially useful in buildings, according to Mr Groat. Bacteria have already been scientifically exploited by Arup in reclaiming contaminated land masses. The use of plastics or polymers is steadily growing in the building industry. The latest advance on glass-reinforced plastic, which has been used for decades in cladding panels, is fibre-reinforced plastics or advanced composites, in which the fibres are precisely orientated for maximum strength in a similar manner to the steel bars in reinforced concrete. This gives fibre-reinforced plastic a strength-to-weight ratio four times better than

and even plastics. PVCu window frames are now being manufactured with an internal core of recycled plastic. As in other industries, the computer is having a profound impact on the design and manufacture of building components. With the use of advanced computer-aided design and manufacturing techniques, complex three-dimensional shapes can be economically cut and fabricated in virtually any building material. This enables building elements - whether in steel, plastic, wood or concrete - to take elaborate shapes, while precision laser techniques of cutting and setting out means they can be assembled with finer tolerances and virtually seamless joints. In the work of the avant-garde American architect, Frank Gehry, whole buildings take on the appearance of free-form sculpture - an architectural style virtually impossible to realise without the computer. Finally, advanced modern technology is coming to the rescue of ancient buildings. High-tech methods of non-destructive testing, including X-rays, radar, ultrasonics, endoscopy, spectrometry and photogrammetry, are the building industry's answer to key-hole surgery. They enable buildings to be precisely surveyed and scientifically analysed without damage.

Providers: by James Macneil

On shaky foundations

Both researchers and the industry need to co-operate on long-term objectives

Construction research organisations are facing an uncertain future. After five years of recession, the amount of money the sector spends on research has shrunk and end users are calling for more relevant and efficient use of the limited funds available. And, at the same time as customers apply pressure, the government is planning to sell the Building Research Establishment (BRE), a traditional stalwart of research work in the industry. Organisations involved in R&D in the construction industry reflect the short term and specialised interests of the companies, academic and trade associations and establishments that make the industry up. These include the government-owned BRE which supports the government's con-

struction programme and construction-related legislation, a diverse university sector known for the quality but not necessarily the relevance of its output, trade and research associations that focus their efforts on distinct sectors and materials, and construction contractors and consultants. According to Department of Environment figures due out in next month, £236m was spent on construction research in 1994. Private companies contributed 60 per cent of this total. The bulk of this work was carried out by materials manufacturers and equipment developers as part of product development programmes.

Construction contractors only contributed £9m to research while consultants contributed £10m. A handful of big clients spent around £8m. However, this figure excludes money spent solving problems arising on individual projects which is notoriously difficult to calculate as it often not recorded. Estimates of how much such site-related research costs range between £22m and £50m per annum.

The government's BRE plays a leading part in the sector. In 1994-95 it had a total income of £41.5m, of which £26m came from the government. For the past 75 years, it has been responsible for construction research in support of legislation such as building regulations and has also played a part in investigating building-related disasters such as the Bradford football ground fire. It is renowned worldwide as a centre of excellence and for its unique testing facilities, such as a full size building frame used for strength tests housed in a former airship hanger in Bedfordshire.

But, the BRE also has its critics. Its lack of success in winning commercial research commissions has led some people to suggest that it could benefit from more commercial management (see box). According to the DoE report, university research accounts for £54m of research. This has risen by 64 per cent since 1990. Much of this increase can be attributed to a change in the attitudes of academics to research. Whereas previously they worked in isolation from industry, many government-sponsored research programmes, such as the DoE's Partners in Technology (Pit) scheme, require bids from joint ventures between university researchers and commercial companies.

Future poised in the balance

Construction R&D income (£m)	1990			1992			1994		
	1990	1992	1994	1990	1992	1994	1990	1992	1994
Companies' in-house facilities (of which construction companies)	96	92	97	18	14	9	33	39	54
Universities	26	27	34	7	9	8	26	32	33
Building Research Establishment	7	9	8	7	9	8	26	32	33
Transport Research Laboratory	26	32	33	26	32	33	26	32	33
Consultants	26	32	33	26	32	33	26	32	33
Research organisations	26	32	33	26	32	33	26	32	33
TOTAL	198	216	236	198	216	236	198	216	236

matched from private sources. This has led to consortia being formed between researchers and the private sector. Private sector companies often make their contributions in kind, counting the hours spent working on the research by staff as part of matching funds. Senior figures on the research side of the industry see this as the continuing challenge for the industry. "We have to look at how the industry can be motivated to take up research findings," says Mr Richard Hodgkinson, BRE's construction programme manager. "Taking risks by innovating does not necessarily fit with the conventional contractual structure of the industry."

The sale of the Building Research Establishment, one of the government's lesser known privatisations, could be the catalyst for a rationalisation of the research provision in the construction industry. Industry leaders are pushing for the BRE to become the first research organisation to come under the wing of a proposed National Construction Centre. This is to be an organisation designed to promote innovation in the traditionally conservative construction industry. Proponents of the NCC argue that the centre will help co-ordinate research effort in the construction industry. This would build on the DoE's efforts to date to engender a more

co-ordinated approach to research through the creation of guidelines for the content of government-funded research initiatives. The consultants Coopers and Lybrand have been appointed to propose an effective structure for the NCC. This is to be put to the DoE in the autumn. Should the idea prove unworkable then the organisation will be sold to a private bidder. If income from the government was guaranteed, this could prove a lucrative purchase. However, opponents of a sale to the private sector say that if the organisation were to be broken up, then the industry would suffer from the loss of its independent views.

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IV UK CONSTRUCTION RESEARCH

Safety by David Taylor

Fire - the vital area of research

Modern methods are starting to unlock the secrets of this elusive and destructive element

In April this year, a ball of fire swept through Düsseldorf's airport terminal building, destroying nearly half of it and killing 18 people. In the outcry that followed, German state prosecutors pointed the finger at a maintenance company and its subcontractor.

The cause of the fire was quickly identified. But what is more shocking than the alleged negligence of the welders who sparked the blaze, is that the chain of events which followed, culminating in the deaths and injuries in the arrivals hall, had been accurately predicted by scientists in the UK.

"It appears that sparks ignited some cable insulation and that smoke and fumes entered the air-conditioning system and was driven down to floor level. We showed two or three years ago that air-conditioning will drive smoke down to floor level if it is left on after a fire has started," says Mr Peter Johnson, fire safety engineer with London-based consultants Ove Arup.

Fire is probably the most

important area of safety research in the construction industry today. Several recent fires - including those at the Sun Valley food processing factory in which two firefighters died and more recently the supermarket fire near Bristol which killed the first British woman firefighter to die on duty - have focused attention on the problem.

At Düsseldorf, nearly all the deaths and injuries were caused by inhalation of toxic fumes. If the knowledge gained by Arup's research had been available to the designers of the airport, systems could have been provided which might have saved lives.

But fire is also at the top of the research agenda because modern methods are beginning to unlock some of the secrets of this most elusive and destructive element. Mr Johnson and his colleagues at Ove Arup had studied several hypothetical fires of the type that swept through Düsseldorf airport, using a technique known as computational fluid dynamic (CFD) analysis.

"CFD enables us to work out how a fire is likely to spread within large enclosed spaces and in complicated spaces," says Mr Johnson. "Computer modelling has made a tremendous difference, although the

skill of the analyst using the tool is very important."

Mr Johnson says that the arrival of CFD has taken fire safety engineering on by leaps and bounds. "It allows us to move away from building codes based on prescriptive rules towards new ones based on performance requirements."

Fire safety engineering, although still developing, is already an established discipline. Its philosophy is simple: it is to reduce costs and

The philosophy is to reduce costs and improve design efficiency

improve efficiency of design while maintaining adequate, and appropriate, levels of safety. Current building codes require fire doors, sprinklers and similar measures, to be designed as failsafe methods of reducing the likelihood of fire being propagated in a building. Fire safety engineering allows such measures to be used only where they are actually needed - with resulting cost benefits.

The proven benefits of this

approach will culminate in the introduction, around the turn of the century, of new Euro-codes based on fire safety engineering principles to replace the current prescriptive ones.

CFD allows fire safety engineers to replicate a real fire inside a real building. But at the Building Research Establishment's large test facility - an eight-storey steel framed building erected inside the cavernous hangar at Cardington that used to house the R101 airship - this is being done for real.

For the past two or three years, the Cardington facility has provided a unique opportunity to study building fires under real conditions. The tests themselves have ranged from very controlled fires on specific elements of the structure to a fire started in a real office, furnished especially for the purpose with desks, chairs, carpets, computers and all the other junk you would expect to find.

Tests like this provide an invaluable back-up to the computerised models, says Prof Hing Galvanessian of the BRE's Safety of Structures department. "There have been tremendous advances in analysis methods using computer modelling," says Prof Galvanessian, "but we need to check

these against real tests."

It will be two or three years before all the results from these tests are available. But progress so far has been sufficiently encouraging for the BRE to plan subsequent similar projects for timber-framed and concrete frame structures - funds permitting, of course. The Cardington project has provided a unique opportunity to study a real structure's response to fire - as well as other loads, stresses and strains.

Now, as this project reaches its conclusion, fire research will continue at a new £3m "burn hall" opened this month at BRE headquarters in Garston.

"Experiments here will follow more traditional lines than those at Cardington," says Mr Martin Ship, head of the fire special interest group at BRE. Among the projects researchers here will be carrying out are the study of smoke movement in open spaces; the effects of blast on different cladding materials and the combustion of insulation materials used for electrical cables - the source of the toxic fumes which killed so many at Düsseldorf.

David Taylor is features editor with Construction News

Environmental impacts by Elaine Krutt

Energy's real costs

Research is often contradictory because guidance standards are lacking

Organisations investing in new buildings are increasingly aware that going green pays dividends - both in terms of public relations and reduced energy bills. But not all companies commissioning new buildings are aware that the finished scheme's reduced running costs and certificate of environmental friendliness do not tell the whole story. Divide a building into its component parts and examine the materials' history, and you enter a whole new debate.

One key issue is "embodied energy", a shorthand term covering the energy consumed in the production, manufacture, use and disposal of any construction material. To achieve maximum points for saving the planet, buildings should not only have higher insulation and lower appetites for energy, but contain materials that leave a minimal legacy of environmental damage. However, the problem is that these two concerns do not always coincide.

For example, the energy saved over a building's lifetime by installing double glazing units may have been bought at the price of the extra CO₂ released into the atmosphere during the manufacture of the PVC frame.

But if timber is used as a more environmentally acceptable alternative, what about the energy expended on importing it into the UK - since 85 per cent of timber used in construction is non-indigenous - and what about the environmental cost associated with renewing the wooden frames long before the PVC equivalent would need replacement? "It's a very difficult area, full of contradictions and paradoxes," says Mr David Turrent, an architect and director of the Energy Conscious Design Partnership.

To date, the construction industry has paid more attention to the environmental impact of the finished building rather than its embodied energy content, a fact

reinforced by the industry's standard environmental rating system.

BREEAM, the voluntary environmental assessment method, administered by the DoE's Building Research Establishment and now widely taken up in the office sector, concentrates, in assessing impact on the environment, more on energy and water consumption, the avoidance of obviously hazardous materials and the use of recycled products than on the examination of the materials' supply chain.

But although embodied energy was once seen as unimportant compared to the energy a building consumed in its lifetime, it is now recognised that once a building undergoes a series of refits, the energy consumed by its materials can be environmentally significant.

According to Mr Lawrence Waterman, managing director of Aylesbury-based consultant Spool Environmental Management, clients and designers are only just getting to grips with these "material" issues.

"In the past few years, major companies have become good at making sound decisions on energy management in their buildings. But with the exception of tropical hardwoods like mahogany, very few people are looking at the cradle-to-grave impact of the materials," he says.

"Environmental measures like moving away from air-conditioning in favour of natural ventilation have now become fairly mature. Hopefully, a similar maturity will develop in the selection of materials in the next five or six years."

For designers who do want to make informed choices on specifying materials on embodied energy criteria, research and guidance are often inconclusive and contradictory, because no standard assessment methods have been devised. Rival reports have estimated the energy embodied in steel at 16 gigajoules/tonne to 50 gigajoules/tonne, while timber figures have ranged from 0.5 to 7 gigajoules/tonne.

"There's plenty of research from the various trade associations, but their findings tend to be drowned out by the noise of axes being ground," says Mr Waterman.

The organisation with the most advanced understanding of the area is probably the consultancy arm of quantity surveyor Davis Langdon and Everest, which has pulled together research from different sources into its own database.

Mr John Connaughton, a partner, believes that "broadly speaking, a consensus is possible" on calculating a building's embodied energy content, but he still sees little interest in the subject from the DoE and architects and little prospect of reliable guidelines in the near future.

In the meantime, Mr Connaughton believes that environmentally conscious designers ought to be reducing their use of energy-guzzling, CO₂-emitting materials such as steel, aluminium and glass, and opting instead for brick and timber buildings with smaller-than-average glazed areas.

As for cement, its low-energy rating can be reduced further by using recycled concrete waste as the raw material, an environmental boon in the use of growing resistance to sand and gravel quarries. But if that concrete then has to be reinforced with steel rods, its embodied energy level shoots up and the environmental benefit is annulled.

One area where matters are clearer is the timber industry, where a certification scheme for timber for environmentally sustainable forests does exist and has been signed up to by around 40 British householders, contractors and DIY chains.

The scheme, from the Friends of the Earth-backed Forestry Stewardship Council, sets high standards for forestry management and tree replacement programmes and also assesses the energy impact along the supply chain before the resulting timber can be labelled as FSC-approved.

"The FSC logo is a very new initiative, but we're cautiously optimistic," said FSC campaigner Ms Sarah Tyack. However, the scheme has drawn criticism for setting such strict rules that demand for cannot be met and FSC-stamped timber will only be available at a price premium. Elaine Krutt is a senior reporter on Building magazine

Righting wrongs

"Better reliability is the direction in which we're all now starting to move, and it's very much what we're working on with new methods of modular construction and off-site fabrication," says Mr Peter Head, director of engineering consultants Mansell of south London.

But safety research is not just about finding new methods and materials. It is also about correcting errors made in the past. Last month, the Highways Agency revealed details of how it intends to tackle the widespread deterioration of the concrete supports carrying the M4 motorway over Chiswick Flyover.

The problem is well understood. De-icing salts from the carriageway have penetrated the concrete structure below and started to attack the steel reinforcements within. The ensuing corrosion not only eats away the reinforcement, but causes the concrete to crack and flake.

The problem will take many millions of pounds to solve and up to 10 years to remedy but no one will know for sure until work by the Transport Research Laboratory is complete. Contractors will soon start work on the removal of one complete concrete crosshead beam which TRL scientists will

then subject to a battery of chemical, physical and ultrasound tests in their quest for a solution.

"There are huge concerns about structural safety," says Mr Head. "When people designed these concrete structures, they thought they'd last forever. Now we know they won't so we design in different ways. That's why, on the second Severn Bridge, all the prestressing tendons are external to the concrete envelope. When they start to deteriorate, they can be replaced without having to dismantle the whole structure."

David Taylor



Reaction to fire: a test on wall lining materials

Picture BRE



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